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ABSTRACT

The 1987-88 annual report reviews progress on 17 longitudinal studies to determine the efficacy of early intervention with handicapped children. The overview chapter reviews previous research on this topic; considers ethical, practical, and scientific considerations of randomized experiments in early childhood special education; examines benefits and procedures for economic evaluations, and describes the design of the longitudinal studies. The second section reports the preliminary findings of each of the 17 studies. In addition the following cross study issues are considered: intervention with medically fragile infants and young children; comparison of parent-infant interaction coding systems; assessment of family functioning; family characteristics, family type, and stress in families with children who are handicapped; relationship of demographic and family functioning variables to parent involvement; measurement of parent involvement; costs of early intervention; and evaluation of the usefulness of the Battelle Developmental Inventory for making special education eligibility and placement decisions. The final chapter describes the Early Intervention Program Inventory, a data base intended to facilitate the comparison of results of program evaluations. Briefly noted are reports on the advisory committee, the graduate student training component, and dissemination activities. Appendixes include guidelines for interpreting outcome measures, the Early Intervention Program Inventory, and the agenda and minutes of the Advisory Committee. (Author/DB)

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PREFACE

The following document contains the 1987-88 annual report of the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children.** This study is being conducted by the Early Intervention Research Institute at Utah State University as a part of a contract with the United States Department of Education, with additional funding being provided by the National Institute of Child Health and Human Development and the Bureau of Maternal and Child Health of the Public Health Service (Contract #300-85-0173). The study was initiated in the Fall of 1985. As called for in the study specifications provided by the federal government, the first subjects were enrolled in the longitudinal phase of the study in October of 1986. The study is designed to be continued at least through the Fall of 1990, with the Expectation that another contract will be competitively awarded at that time to continue data collection efforts for an additional five years.

We emphasize that data, results, and tentative conclusions contained in this report are preliminary. We continue to enroll subjects in many of the studies, additional data are being collected, and additional analyses are being done on an ongoing basis. Furthermore, even though care has been taken to discover key punching, transcription, and computational errors, it is certain that not all such errors have been identified and corrected in time for this draft copy of the annual report. As work continues, more up-to-date information on any study reported in this document will be available from the Early Intervention Research Institute. Interested parties may contact the institute directly to obtain such information.

Staff members contributing to this report include: Steve Barnett, Diane Behl, Glendon Casto, William Eiserman, Colette Escobar, Ellen Frede, Lee Huntington, Nancy Immel, Mark Innocenti, Chuck Lowitzer, Lance Mortensen, Marcia Summers, Carol Tingey, Karl White, and Teri Wingate-Corey.

I. OVERVIEW

In the Fall of 1985, the U. S. Department of Education undertook a significant new initiative to investigate the longitudinal effects and costs of providing alternative types of early intervention services to handicapped children. Through a competitively awarded contract to the Early Intervention Research Institute at Utah State University, planning was undertaken for a series of longitudinal studies of early intervention efficacy.

Background

The impetus for this type of a large scale research project stems from at least three sources. First, over the past 25 years, hundreds of research studies have been conducted to investigate the efficacy of early intervention programs with handicapped, disadvantaged, and at-risk children. Unfortunately, much of this research has suffered from serious methodological flaws, narrow definition of outcomes, and/or inadequately implemented interventions (Dunst & Rheingrover, 1981; Simeonsson, Cooper, & Scheiner, 1982). Most of the research which has been well done, has been done with disadvantaged children, and there are questions about the degree to which findings from research with such children will be applicable to handicapped children (White & Casto, 1985). Consequently, there is very little credible research data which can be used to draw conclusions about what types of early intervention programs are best for which children.

Second, during the last 20 years there has been a dramatic increase in the availability of early intervention programs for handicapped children. This expansion is expected to continue and even increase with the recent passage of Public Law 99-457 which provides significant initiatives for states to mandate early intervention programs for handicapped children by the Fall of 1990. Although much progress has been made, it is evident that the lack of high-quality research with handicapped children has been a substantial impediment to improving the quality of early intervention services to handicapped children. Furthermore, the rapid and continuing expansion has increased the need for better information about which early intervention programs are best for which children.

Third, during the last decade, resources for providing human service programs have become increasingly limited. This has led policy makers and program administrators to be more concerned about the costs as well as the effects of all human service programs. With regard to early intervention, there have been increasingly frequent questions about which types of programs are most cost-effective. Unfortunately, very little previous early intervention research has included a cost analysis component.

It was in the context of these three factors: 1) limited high-quality early intervention research with handicapped children, 2) pressures to expand early intervention programs for handicapped children, and 3) the almost total absence of efficacy research which includes a cost-analysis component, that the U. S. Department of Education issued a Request for Proposals (RFP) in the Spring of 1985. This RFP called for a contractor who would conduct a series of experimental studies investigating the effects and costs of alternative types of early intervention with handicapped children. The RFP stipulated that each of those studies must be a randomized experiment in which two alternative types of intervention were compared, must consider the effects of the intervention for both children and families, must analyze the costs in conjunction with the effects of the alternative types of intervention, and must be carried out in field-based settings which were representative of state-of-the-art early intervention programs.

The RFP required that one group of studies would investigate the effects of varying the intensity of the intervention program, another series would investigate variations in the age at which the comprehensive intervention program began, and a final group of studies would investigate the effects of program variation. These studies were to be done with various subgroups of handicapped children (e.g., visually impaired, hearing impaired, severely handicapped, etc.) instead of with disadvantaged or at-risk children. The contract provided funding for a 5-year period so that the effects of intervention could be assessed longitudinally, but the money was limited to actually conducting the research and could not be used to fund the intervention programs.

As a separate part of the contract, the recipient was also required to develop a system which could be used to describe the participating children, the nature of the intervention program, the costs, and the effects of a series of early intervention programs for handicapped children. This system was to be designed in such a way that it could be used on a regional, state, or national basis. The intent of this data collection system was that it could be used by program administrators (e.g., a state coordinator of preschool programs) to systematically and objectively describe the type of programs being offered, identify gaps in the existing system, and draw conclusions about which programs were best for a particular purpose.

Specifications for the contract required a series of feasibility studies during the first year (1985-86), after which the Government would decide whether it would proceed with all or part of the proposed research workscope. A decision to proceed would be made by exercising one or more of the contract "options." Option 1 was the series of studies investigating the effects of varying the intensity of intervention. Option 2 included the studies designed to investigate the effects of varying the age at which early intervention began. Option 3 consisted of the studies designed to investigate the effects of program variation. Finally, Option 4 included the development and testing of the procedures and protocols for a system for describing early intervention programs.

Based on the work done during that first year (1985-86), the Government decided to exercise all four options of the contract. As a result of the government's decision, the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children** were initiated in October of 1986 and will extend through September 30, 1990. Depending on the results of the project to that point in time, federal officials have announced a tentative plan to competitively award another 5-year contract which will continue to collect data so that the long-term effects of early intervention with handicapped children can be assessed.

The purpose of this report is to summarize the current status of the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children**, describe the accomplishments during the third year of the project (1987-88), and describe the plans for the 1988-89 year. To set a context for the main body of the report, we will briefly summarize the activities and accomplishments during the first and second years of the project (1985-86 and 1986-87, respectively), and outline the workscope of the third year (1987-88) of the project.

Summary of Accomplishments During 1985-86

The primary task during the first year of the project was to identify the sites that would participate in the longitudinal studies. This task was made more difficult by the constraints imposed by the original RFP. For example, since the contract funds could not be used to actually provide services, service programs had to be identified who were willing and able to contribute financial resources (often substantial amounts) to conducting the expanded services necessary for the comparative experiments. In addition, collaborators had to be willing to abide by the conditions of the contract (random assignment of children to groups, extensive data collection for participating children and families, and provision of data necessary to calculate program costs and to verify treatment implementation). Finally, the type of research called for in the RFP eliminated many potential collaborators because of the necessity of having fairly large groups of handicapped children who were available for participation in the experimental groups.

The foregoing requirements necessitated a nationwide search for projects who were interested in collaborating in the longitudinal research. Over 50 programs were contacted and almost 25 were visited during the recruitment phase of the project.

Using carefully developed criteria, EIRI staff narrowed the potential participants to a final set of 16 studies which were initiated in the Fall of 1986.

Another major activity during the first year was the development, pilot testing, revision, and finalization of the various procedures and protocols necessary to implement these studies. For example, from among the hundreds of measures available for measuring child and family progress, EIRI staff had to select those measures which appeared to be most appropriate for these particular studies of early intervention. Procedures also had to be developed for randomly assigning children to groups, conducting the cost-analyses, and collecting data on treatment verification. In some cases, the sites identified as collaborators needed assistance in enhancing various aspects of their program so that the research could be conducted. For example, staff worked with some programs in developing better child-find procedures, record keeping systems, inservice training protocols, and child assessment and evaluation techniques.

Based on the work referred to above, a series of four feasibility studies were conducted during the 1985-86 year. Three of these studies were carried out in conjunction with a special funding initiative in the state of Illinois, and one was conducted in Salt Lake City, Utah. Each of these studies used the various procedures, data collection protocols, and management techniques that were being developed for the larger set of studies.

The purpose of these feasibility studies was to collect data that would assist the government in deciding whether it was feasible to conduct the series of longitudinal studies called for in the original RFP. The feasibility studies led to revisions of several protocols and to rethinking of some of the management strategies being considered for the larger set of studies. For example, the feasibility studies made it clear that the degree of training and monitoring that would be necessary for diagnosticians to appropriately use the Battelle Developmental Inventory would have to be substantially greater than had first been anticipated. The feasibility studies also suggested that additional work would have to be devoted to identifying instruments appropriate for assessing motor development in very young children and for assessing mother-child interaction. In many other areas, the feasibility studies yielded valuable insights which had a substantial impact on how the longitudinal studies were eventually structured.

A fourth major activity of the first year was to raise additional money that could be used to enhance various aspects of the research. From the beginning it had been clear that the money available from the U.S. Department of Education would only allow a "bare bones" research project to be conducted. Particularly concerning was the limited amount of funds available for collecting outcome data for children and families, and the lack of funds available for "buying out" a portion of time of some of the staff at each of the collaborating research sites that would allow them to devote the necessary time and effort to the liaison activities necessary in this type of research.

During the first year (1985-86) EIRI staff devoted substantial amounts of time and effort to raising additional funds. Hundreds of private foundations were contacted, the Utah State Legislature was approached, and work was initiated with several other federal funding agencies. As a result of these efforts, an ongoing $50,000 per year appropriation was received from the Utah State Legislature, a number of small donations were obtained from private companies and foundations, and a substantial amount of money was obtained from the National Institute of Child Health and Human Development, and the Bureau of Maternal and Child Health. The money obtained dramatically increased the amount of data that could be collected as a part of the research and will enhance the interpretability of those data because of the expanded treatment verification and site liaison activities.

By the end of 1985-86, the United States Department of Education had decided to exercise all four options of the original contract and to proceed with the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children.**

Accomplishments During 1986-87

Although the contract did not call for the studies to begin until October 1, 1986, when the second year of the contract actually began, it was necessary to begin several of the studies prior to that time because of the service year calender of several of the collaborators. In other words, for some of the collaborators, the service year began in August or September and in order to have children randomly assigned to groups, it was necessary to begin the experiment at the beginning of their service year as opposed to part way into it.

From the beginning it was clear that the continuation of any one of the studies for the full time period of the contract would depend on a number of factors which were not under the control of EIRI or the service provider. For example, a number of the programs depended on state appropriated money for both their basic program and the expanded program necessary to do the research comparisons. If the state cut funding for the program, the research project would be jeopardized. In other cases, the recruitment of subjects did not proceed as projected and the success of the project was called into question (e.g., in several studies with low birthweight babies with intraventricular hemorrhaging, we found the incidence to have dropped substantially from previous years). Because the successful implementation of any given study was in part dependent on factors which we could not control, we continued to recruit additional sites and maintained several alternative research sites.

The following activities occurred during the second year of the project (1986-87).

Study implementation. Eighteen different longitudinal studies were implemented. These included several changes from those studies reported in the baseline report. For example, based on much lower than estimated recruitment, we decided to only conduct one study for children with intraventricular hemorrhage instead of the two originally planned in conjunction with Louisiana State University. The second LSU/IVH study was replaced with a similar population of children in the Salt Lake City area. For similar reasons, the Alabama Institute for the Deaf and Blind Visually Impaired study, and the

Citizens for the Disabled study were dropped based on much lower enrollment of subjects than anticipated. Those two studies were replaced by studies at Phoenix Children's Hospital which were designed to investigate intensity and age-at-start issues with children who have suffered traumatic brain injury.

Refine procedures. The basic procedures for conducting the studies were developed during the initial year of the project. However, during 1986-87 it was evident that several areas needed further work, particularly the procedures for recruiting, training, and monitoring diagnosticians; treatment verification; and cost-data collection. Work in these areas proceeded simultaneously with the implementation of the studies.

Recruitment of additional sites. As discussed above, there was a need to replace several of the research sites identified in the baseline report. In addition, there is always a possibility that one of the existing sites will experience difficulties and have to be dropped. Hence, substantial efforts were devoted to identifying and recruiting potential collaborators. The two sites at Phoenix Children's Hospital, the Salt Lake City IVH site, and the alternate site in Reno were added this year as a function of those ongoing recruitment efforts.

Finalize arrangements for additional resources. During the 1985-86 year, preliminary approval was obtained from the National Institute of Child Health and Human Development and the Bureau of Maternal and Child Health for supplementing the Department of Education contract. However, substantial additional work was necessary to finalize those arrangements. Negotiations were completed in April of 1987 with NICHD, and in July of 1987 with MCH.

Training of graduate students. A part of the workscope specified in the RFP was the provision of training to graduate students. During 1986-87, 19 graduate students and one post doctoral fellow were employed by the institute. These individuals participated in all aspects of the work commensurate with their skills and experiences.

Workscope for 1987-88

During 1987-88, institute staff continued the conduct of the studies initiated the previous year. An overview of the major activities during 1987-88 is given next.

Management of individual studies. Individual site coordinators worked with each of the study sites to oversee the implementation of alternative interventions to ensure that alternative interventions were appropriately implemented. Periodic site visits and weekly telephone contacts were made to each of the sites. A formal onsite evaluation using a structured format was conducted. The site coordinators arranged for the collection of treatment verification data and arranged with the liaison person at each site for the collection of pre- and posttest data. Data collection required the recruitment, training, and monitoring of diagnosticians in each of the sites. The site coordinators also worked with economists at the institute and with site liaisons to collect the necessary data for cost analyses. The management of the research comparisons at each of the sites required continual attention to make sure that necessary data were being collected and that alternative implementations were being implemented as planned. As outcome data were collected, site coordinators were also responsible for cleaning, double checking, and entering the data into the computer files.

Recruitment of sites. Due to difficulties in recruiting the number of subjects they had originally expected, three sites were dropped near the beginning of the 1987-88 year (Alabama Hearing Impaired, Wabash and Ohio, Indiana School for the Deaf). This necessitated the recruitment of additional sites. As a result of these recruitment efforts, site in Columbus, Ohio, Salt Lake City, Utah, and Chicago, Illinois, were added during the 1987-88 year. Because the project requires longitudinal data to be collected, it is expected that these will be the last sites added and that no further recruitment will be possible. Substantial additional work was done during the year to identify an additional hearing impaired site with contacts being made in Houston, Florida, South Carolina, California, and Michigan. Although people in each of these sites expressed a great deal of interest in participating in the longitudinal research, the unavailability of sufficient funds for the service component of the research prevented any of them from becoming involved.

Procedural refinements. A longitudinal study of this nature requires ongoing procedural refinements. During the 1987-88 year, particular attention was devoted to measuring the degree to which parents are involved in early intervention programs. A number of alternatives were tried including telephone interviews, interviewer ratings, parent reports using postcards, and time diaries. None of these have proven particularly successful, and we will continue to examine alternative approaches. Procedures for the estimation of costs have also been refined during the year. It was discovered that site liaisons require substantially more assistance than originally expected. Thus, procedures have been altered to account for the provision of such assistance. Effort was also devoted to refining the scoring systems for parent-child interaction. Different established scoring systems are being used to score the same videotapes. This information will be used to determine which scoring system produces the most accurate and valid estimator of parent-child interaction,

Analyses. Because of the extensive data being collected at each study on child and family functioning, demographic characteristics, and treatment verification variables, a number of different kinds of analyses are possible. During the 1987-88 year, samples sizes in many of the sites became large enough so that these analyses were initiated. The results contained in this annual report represent the beginning of analyses that will be done. Since additional subjects will be added to most of the sites and additional data will be collected, the results should be regarded as preliminary. During the 1987-88 year, the attention of research staff began to shift from the recruitment of sites and implementation of research to conducting the analyses. As time passes, this balance will shift more and more from monitoring of treatment implementation to analyses.

Training of graduate assistants. A part of the workscope specified in the RFP is the provision of training to graduate students. During the 1987-88 year, 20 graduate students and one postdoctoral fellow were employed by the institute. These individuals have participated in ways commensurate with their skills and experience in all aspects of the work described in the remainder of this report. Senior staff members at the institute view the mentoring responsibilities associated with having graduate students as an important part of their work and spent a significant amount of time in activities related to this role.

Dissemination. An important part of the institute's workscope is to disseminate information to professionals, parents, policymakers, and administrators. During the first several years of the project, dissemination was limited because the actual research had not yet been initiated. As results have been accumulated, the productivity of the institute staff has risen. During the 1987-88 year, 55 journal articles, chapters in books, or manuscripts were produced; and 85 presentations were made at professional meetings.

The remainder of Section I summarizes the research literature on which the longitudinal studies are based, discusses methodological issues (i.e., randomization and economic evaluation), and summairzes the design of the longitudinal studies.

Previous Research on the Efficacy of Early Intervention with Handicapped Children

The term "early intervention" encompasses a wide variety of medical, educational, and psychological treatments such as vestibular stimulation for cerebral palsied children, language therapy for hearing impaired children, auditory and kinesthetic stimulation for low birthweight infants, educational programming for disadvantaged children, instruction in self-help skills for mentally retarded children, and diet therapy for hyperactive children. Intensity of programs range from a few seconds of vestibular stimulation once per day for a week, to 40 hours per week of intensive educational programming beginning at birth. Objectives range from prevention to complete resolution or amelioration, to slowing the rate of degeneration, to helping families to cope. The wide range of intervention procedures, target populations, intensities, and objectives makes it clear that there are no simple answers to the question, "Is early intervention effective?"

Over the last 20 years, the number of early intervention programs for handicapped, at-risk, and disadvantaged children has increased dramatically. More than 30 states now mandate early intervention for preschool-aged handicapped children and it is certain that the number will continue to grow as a result of Public Law 99-457. Head Start serves more than 400,000 children each year. The federal Handicapped Children's Early Education Program (HCEEP) has funded more than 300 demonstration projects over the last 16 years, 22 of which have been approved for national dissemination, resulting in more than 2,000 replications in other sites (Roy Littlejohn Associates, 1982). Exact estimates are difficult because of problems in defining exactly what early intervention is, but it is safe to say that millions of children are served each year at an annual cost of billions of dollars.

As the frequency of early intervention programs has increased, questions about the efficacy of early intervention have also increased. Such questions have generated thousands of articles and hundreds of research studies, and many promises have been made to parents, legislators, and educators. Unfortunately, the data from early intervention efficacy research have been somewhat discrepant. For example, there is growing agreement among practitioners that early intervention promises significant resolution to some of the most persistent and expensive problems which educators face. According to Jordan, Hayden, Karnes, and Wood (1977):

> Programs providing early educational and therapeutic programming to meet the needs of young handicapped children and their families are reducing the number of children who will need intensive or long-term help... with early help, the sooner the better, these children can often function at higher levels than has been dreamed possible in prior years. (p.26)

However, the benefits of early intervention have not been universally accepted. As Hodges and Sheenan (1978) pointed out:

integrative reviews of the literature, there is no reason why it should not be just as useful in such efforts as it has proven to be in conducting primary research.

Delimiting the question. In delimiting the questions which would guide our investigation, we cast a deliberately broad net. Our goal was to critically examine all experimental studies of interventions that began before 66 months of age with handicapped, disadvantaged, and at-risk children. We defined *handicapped children* following the guidelines proposed by the U.S. Department of Education under PL 94-142. *At-risk children* were defined as those who had suffered from trauma surrounding birth. *Disadvantaged children* were defined as those with low socioeconomic status. With the exception of surgical or dietary interventions, we included all educational, psychological, or therapeutic interventions which presented data about an intervention designed to (1) prevent the onset or further progression of a disability, (2) produce actual improvement in the functional ability of the child, or (3) provide support in situations in which a handicap was already established.

Reviewing previous work. We began our investigation by critically examining 52 previous reviews of the early intervention efficacy literature. (See White, Bush, & Casto, 1986 for a complete report of this analysis.) The analysis identified primary research studies to be included in our review and guided our thinking about methodological approaches and the variables which needed to be considered.

Generating hypotheses. By analyzing previous reviews, we also generated hypotheses that needed to be tested, as summarized in Table I.1. Previous reviewers consistently cited a number of variables as being associated with intervention effectiveness, such as age at which intervention begins, degree to which parents are involved, intensity of the intervention, and many others. For example, 29 of the 52 reviewers cited parental involvement as a mediating variable, and 26 of the 27 that drew conclusions about the effects of parental involvement concluded that more parental involvement was directly associated with early intervention efficacy. Alternatively, 10 reviewers cited socioeconomic status of the family as an important mediating variable--7 of whom drew conclusions about how this variable affected intervention efficacy. However, only 4 of 7 agreed that intervention was more effective with economically deprived children, and 3 concluded that socioeconomic status is unrelated to intervention efficacy.

Table I.1

Most Frequently Cited Concomitant Variables in Reviews of Early Intervention Efficacy Research

Variable	No. of Reviewers	Most Frequent Conclusions (Ratio of reviewers who drew conclusions that agreed)	
Parent Involvement	29	More is better	26/27
Age Intervention Begins	27	Earlier is better	18/24
Duration/Intensity	22	Longer/more intense is better	12/17
Degree of Structure	19	More structure is better	16/17
Training of Intervenor	14	More is better	7/7
Continuity with Public School	13	Enhances intervention	12/13
Type of Curriculum	13	No one type is better	7/10
Setting	11	Home is better	4/8
Socioeconomic Status	10	More deprived children do better	4/7
Individualization	8	More is better	4/4
Child/Teacher Ratio	8	Lower is better	7/7

Selecting a sample from which to collect data. The analysis of previous reviews proved to be the best source of identifying studies to be included in our analysis. We also conducted an extensive computer-assisted bibliographic search, we sent letters to colleagues to identify fugitive literature, and we examined references to efficacy studies in articles previously obtained. Less than 15% of the studies thus far included in our analysis were identified in the computer-assisted bibliographic search which examined 8 data bases and over 200 terms and combinations of terms. (Casto, White & Taylor, 1983, explain the specific procedures used in the computer-assisted search.)

Collecting data for each study. As each potential study was obtained, it was screened to determine whether it met the criteria for inclusion; those that did were coded by one of the project team members. We attempted to collect data about approximately 90 variables from the following five categories for each study. First, we coded information about the **type of subjects** involved in each study. For example, were they handicapped, at risk, or disadvantaged? How old were they? In what kind of families did they reside? At what level were they functioning prior to the initiation of intervention? Second, the **specific intervention** used was described by coding such variables as the duration of the intervention, the identity of the primary intervenors, and the setting in which the intervention took place. Third, we coded information about the **design of the study** including a rating of the study's methodologic quality based on an analysis of the Campbell/Stanley threats to internal validity (Campbell & Stanley, 1966) in combination with the type of design being used. Fourth, we coded information about the **outcomes that were assessed**, including the domain of the outcome, who collected the data, and how it was collected. Finally the **results of the each study** were computed by taking the mean difference between the groups divided by the standard deviation of the control group's scores (which we defined as an "effect size").

By converting all results to such effect size measures, a common metric was created so that results could be compared across studies which used different ways of measuring IQ or socio-emotional functioning, or parental attitudes. Since outcomes were on a common metric, estimates of program impact could be combined with the information described above about domain of outcome, methodological quality of study, type of subjects used, and the nature of the intervention, to compare results from different studies addressing similar questions.

Each variable was operationally defined in a set of written conventions, and explicit procedures were outlined for coders to follow. Because multiple coders were involved, frequent reliability checks were done, and coders achieved more than 85% agreement for all the variables reported.

Multiple effect sizes were coded for the same study if they added unique information, such as information about language competence versus adaptive behavior or immediate versus long-term data. To prevent giving undue weight to studies that administered many tests, only one effect size was coded for each domain of outcome for any 12-month period of elapsed time. In other words, if a study administered two different IQ tests to the subjects at the conclusion of the study, only one was used in our analysis.

Analysis and interpretation of results. The sixth step of the scientific method is to analyze and interpret the data using replicable procedures. A variety of analytical approaches was used. For example, we hypothesized that if parental involvement were positively associated with intervention effectiveness, then those treatment versus no-treatment studies that heavily involved parents should yield larger effect sizes on the average than those treatment versus no-treatment studies that did not involve parents. If it is generally true that involvement of parents results in more effective interventions, those differences should remain when the analysis is limited to different subsets of the data. Using this rationale, we computed descriptive statistics for the total data set and then those studies that we considered to be of the best quality. We looked at immediate effects versus long-term effects and considered the results of those comparisons when different domains of outcome were considered, such as IQ versus motor development versus parental outcomes.

Finally, and perhaps most important, we examined the results of those few studies that made a direct within-study comparison of high versus low levels of parental involvement. For example, some of the most direct evidence about the effects of parental involvement came from a study in which a center-based program randomly assigned children to a group in which parents were highly involved, or to a group in which parents were involved in a minimal extent, with the center-based program continuing in both groups. Unfortunately, there were relatively few of these "A" versus "B" studies for any given question. The combined results of such "triangulation methods" allowed us to be much more confident about the robustness of our conclusions concerning the different hypotheses investigated.

Results of the Integrative Review

The results of this systematic review were both enlightening and provocative. They have confirmed some common accepted positions, called others into question, and identified the almost total absence of empirical data for either supporting or refuting others. Because the total data set is so voluminous, we note here only those parts of the data which were instrumental in designing the longitudinal studies reported in the remainder of the volume. (More detailed summaries are given by Casto, White, & Taylor, 1983; White & Casto, 1985.)

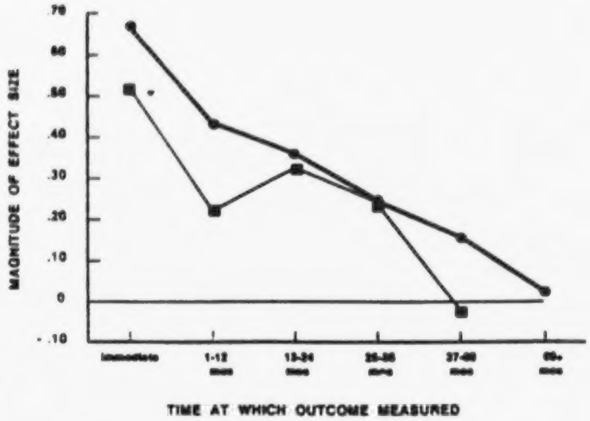
Characteristics of the data set. The data consisted of 2,266 effect sizes from 326 different studies. Data from experimental/control studies, A versus B studies, and single-subject design studies were analyzed separately because of the fundamentally different questions they address. There were 1,121 effect sizes from intervention versus control studies. Most of those (906) were from studies with disadvantaged children, 215 were from studies with handicapped children, and 85 from studies with medically at-risk children. The majority of effect sizes from the handicapped population came from studies which considered the effects of intervention with either mentally retarded children or with groups of children exhibiting a mix of handicaps, but predominantly with mild to moderate mental retardation.

Included in the data set were 984 effect sizes from intervention A versus B studies which have examined such questions as earlier versus later intervention, intervention intensity, and degree of parental involvement. We also examined the results of 76 single-subject design studies, most of which have focused on increasing social interaction, correcting conduct disorders, or developing language competence.

The data set included studies reported from 1937 to 1984, with 70% 1970 and after. Most of those studies were reported in educational or psychological journals, but significant numbers came from medical journals, books, unpublished documents through ERIC, and government reports. IQ was the most frequently measured outcome, accounting for over 40% of all outcomes. There was also substantial reporting of language, academic functioning, and motor functioning, but relatively scarce consideration of social-emotional growth or family outcomes. Over 60% of effect sizes were measured immediately at the conclusion of intervention, and only 11% were measured more than 36 months after intervention concluded--all of those with disadvantaged samples.

Overall effects of intervention. Turning now to what can be concluded from the data about the efficacy of early intervention, we have considered the evidence about early intervention effectiveness separately for studies done with disadvantaged, at-risk, and handicapped children because we believe that the children in each group are so different that combining the data would be misleading. Unfortunately, in many previous reviews of the early intervention efficacy literature, conclusions about the effects of a particular type of intervention for handicapped children have been based primarily on data from studies with disadvantaged children (see White, Bush, & Casto, 1985). Although there is certainly some limited applicability for certain issues, the general practice is highly suspect.

Most of the available evidence about immediate and long-term benefits of early intervention is for disadvantaged children. As shown in Figure I.1, the best estimate of the immediate effect of early intervention for disadvantaged children is approximately one-half a standard deviation. In other words, for IQ measurements, this represents a gain of about 8 points, for motor functioning an improvement from the 30th to the 50th or from the 10th to the 22nd percentile, for reading achievement



● all studies	# ES's	546	110	77	28	53	82
	# of studies	(99)	(24)	(24)	(7)	(9)	(7)
■ good studies	# ES's	153	21	23	15	13	
	# of studies	(31)	(9)	(10)	(6)	(6)	

Figure I.1 Average effect sizes for outcomes measured at various times following completion of the intervention for studies with disadvantaged children.

at the second grade a gain of approximately 10 months of reading. Those are substantial effects that are of obvious clinical importance. The magnitude of these immediate effects is similar for every domain and, generally speaking, for programs using different philosophical approaches conducted in different settings with involvement of different types of intervenors.

Over time, there is a clear tendency for the measurable effects of intervention with disadvantaged children to be substantially reduced. Several caveats are important in interpreting that data. First, when the results are limited to studies of good methodologic quality, they are based on relatively few data, and there are some exceptions to the tendency for data to wash out over time. For example, the recently reported Perry Preschool project data (Berrueta-Clement et al., 1984), which was conducted with disadvantaged children, is not yet included in this data set because of the recency of it publication. This is a well-designed study which reports substantial effects for early intervention on variables such as high school graduation rates, employment, and teenage pregnancy rates. It is also important to point out, however, that there have been other reasonably well-designed studies that have failed to find long-term effects in some of the same areas.

A second caveat is that the presently available long-term data are predominantly IQ and academic achievement data. As more studies collect data such as that reported in the Perry Preschool project, a different picture may emerge.

A third problem is that many people mistakenly assume that long-term effects are essential in demonstrating the efficacy of early intervention. As an example of how such thinking may be incorrect, consider a hiker stranded in the mountains during a winter blizzard. The hiker stumbles across an unoccupied cabin with enough fuel for only one day. When he arrives, he is very cold. Thanks to the firewood he finds he is soon warm and comfortable. The next day the blizzard continues, and he becomes cold again. Few would argue that there was no benefit for him in being warm for one day, even though there was not enough fuel to sustain the warmth. If the only object of early intervention is to permanently change the measured IQ of those children, then these data are discouraging. However, the abundant evidence for other important short-term benefits should not be ignored.

For handicapped children, as shown in Figure I.2, the data is much easier to interpret because there is so little of it. Also, in contrast to data about the efficacy of early intervention with disadvantaged children in which 25% of the available data comes from studies of high methodological quality, only 16% of the data for handicapped children comes from studies of high methodological quality. Furthermore, there is no follow-up data collected more than 12 months after the intervention was completed from studies of high methodological quality. The best estimate for immediate effects is about .40 of a standard deviation. However, this estimate is based on only 20 effect sizes from 11 different studies. The estimate of

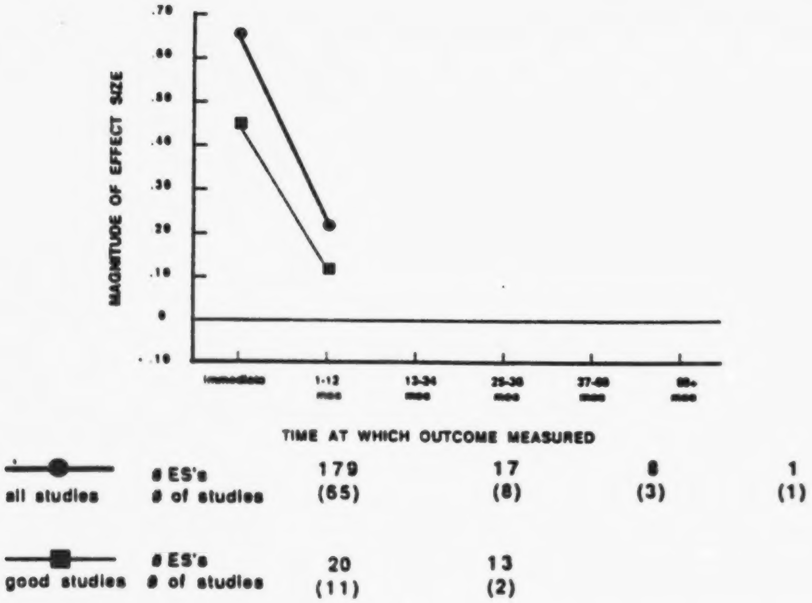


Figure I.2. **Average effect sizes for outcomes measured at various times following completion of the intervention for studies with handicapped children.**

program impact when all studies are included is almost double (.72), suggesting that some of the perception about the magnitude of benefits for handicapped children is based on data of questionable validity. However, the fact remains that there is evidence of a strong and replicable immediate effect for handicapped children based on studies of only good methodologic quality. Unfortunately, those who claim that early intervention for handicapped children results in long-term impact are arguing in the absence of data.

Effects of mediating variables. As noted earlier, White, Bush, and Casto (1985) identified a number of mediating variables suggested by previous reviewers as contributing to the effectiveness of early intervention. Data from our analysis of previous research were used in determining whether these frequently advocated positions could be empirically supported.

Involvement of parents in intervention programs. One of the most frequent conclusions in the early intervention efficacy literature is that programs which involve parents are more effective than programs which do not (Bronfenbrenner, 1984; Comptroller General, 1979; Goodson & Hess, 1975; Hewett, 1977; Wiekart et al., 1978). Although intuitively logical, we have been unable to find strong empirical support for this position. As shown in Table I.2, when values are adjusted for age at which intervention began, time of measurement, and quality of dependent variable, the average of 684 effect sizes from 80 studies in which parents were not used at all or only used to a minor degree was .42. The average of 200 effect sizes (ES) from 27 studies in which parents were used as the major or only intervenor was .41. When effect sizes are limited to only high-quality studies, there is still very little difference between programs that use parents extensively and those that do not.

Table I.2

Average Effect Sizes for Different Levels of Parental Involvement[a]

		All Studies			Good Studies		
Type of Handicap	Parent Intervention	$\overline{ES}$	S_{es}	N_{es}	N	$\overline{ES}$	N_{es}
Disadvantaged	Minor or not at all	.52	.03	684	80	.40	171
	Major or only	.42	.04	200	27	.51	54
Handicapped	Minor or not at all	.72	.07	137	48	.38	17
	Major or only	.59	.09	70	27	.43	6

[a] Values are adjusted for differences in quality of outcome measure and time of measurement

Similar results were obtained when data were examined regarding whether the program was center-based, home-based, or home- and center-based combined; whether parents or parents and children were the target of the intervention; and the degree to which the intervention program intended to involve parents.

The most direct information about the effect of parental involvement was obtained from nine studies which had made direct comparisons between different levels of parental involvement (Abbot & Sabatino, 1975; Bidder, Bryant, & Gray, 1975; Gordon, 1969; Karnes, Teska, & Hodgins, 1970; McCarthy, 1968; Miller & Dyer, 1975; Nedler & Sebra, 1971; Radin, 1971; Ramey & Bryant, 1983). As seen in Table I.3, when all 134 effect sizes from these studies were considered, there is a slight advantage for programs which involved parents more extensively ($\overline{ES}$ = .08). However, these findings are heavily influenced by the Gordon (1969) study, which showed an average advantage of .18 for interventions which involved parents. Although the methodologic quality of the Gordon study is quite good, many of the ES's from his study which compared different levels of parental involvement were confounded with age at start, program duration, and setting. Thus, the results from Gordon (1969) should be viewed cautiously. The other eight studies yielded an average effect size of .06, favoring programs which did not involve parents.

Table I.3

Average Effect Sizes for Within-Study Comparisons of Different Levels of Parental Involvement

	Degree of Parental Involvement[a]		
	$\overline{ES}$	S_{es}	N_{es}
All Comparisons Parent vs. No Parent or More Vs. Less	.08	.05	134
Gordon Study Only More Involvement vs. Less Involvement	.18	.06	70
All Comparisons Except Gordon Study Parents vs. no parent or More vs. less	-.06	.09	64

[a] ES's from 9 studies.

Taken together, these data suggest that early intervention programs that involve parents extensively can be effective, but it does not appear that they are any more effective than programs which do not involve parents. Admittedly, this is counter to the intuitively logical position advocated by many people. Before drawing conclusions about whether parents should be involved in early intervention programs, it is important to note the limitations of the available data. First, most of the arguments in support of involving parents in early intervention programs have come from studies done with disadvantaged children (e.g., Bronfenbrenner, 1974; Gordon, 1969; Rescorla, Provence, & Naylor, 1982). These children often come from large families with high incidences of single parents, poverty, and other stressors, and low levels of parent education--all of which may hinder effective parent participation. Thus, it may be that effective tests of parent involvement have not been done. Second, many of the outcomes included in this analysis (over 40%) are from measures of IQ. It may well be that the involvement of parents leads to gains in other areas which simply have not been investigated. Finally, very few of the effect sizes (less than 2%) came from studies in which the investigators *verified* that parents were actually involved to the degree intended. Thus, it may be that some investigators were examining intended rather than actual parental involvement. These caveats notwithstanding, there are no data at this time to confirm the widely held belief that involvement of parents leads to more effective intervention.

Age at which intervention begins. Another frequently stated position in the early intervention literature is that the earlier the child is involved in a program, the more effective the program will be (Bronfenbrenner, 1974; Comptroller General, 1979; Garland, Swanson, Stone, & Woodruff, 1981). In spite of the popularity of this position, these analyses provide only meager empirical support from intervention versus control studies. As shown in Figure I.3, average effect sizes for studies comparing experimental with control group children beginning at different ages are very similar after adjustments are made for time at which the outcome was measured and quality of the dependent variable.

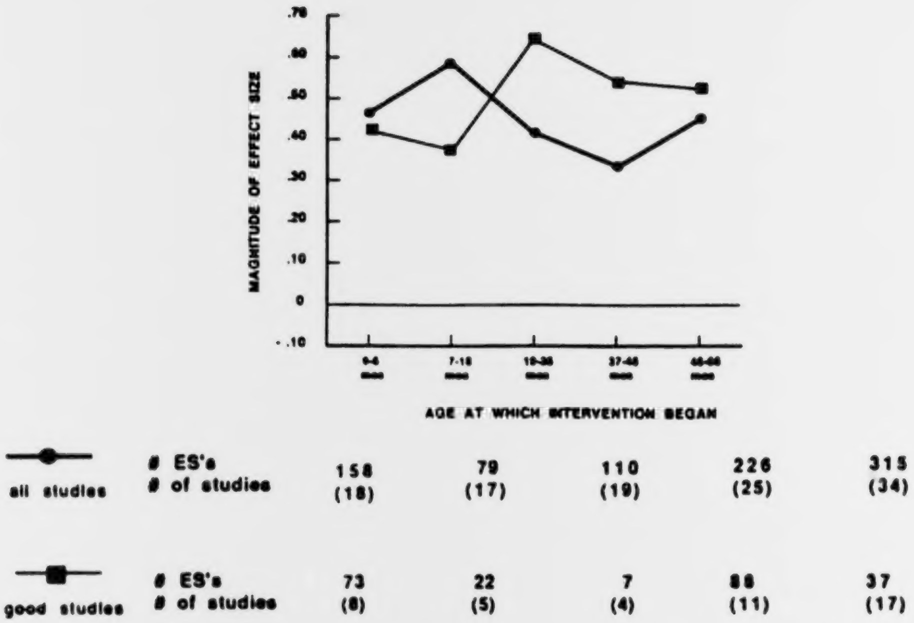


Figure I.3. Average effect sizes for interventions begun when children were at different ages.

As shown in Table I.4, the effect sizes (ES) from five studies which made direct comparisons of starting children at two different ages with all other variables held constant (Braun & Caldwell, 1973; Caldwell & Smith, 1970; Gordon, 1969; Jason, 1977; Morris & Glick, 1977) show .04 of a standard deviation advantage for those children who begin later. Other studies have examined the effect of age at start but have been substantially confounded with other variables such as duration of setting (Beller, 1969; Gordon, 1969; Scott, 1974; Strickland, 1971). These "confounded" studies show an average ES of .16, favoring children who began earlier.

Table I.4

Average Effect Sizes for Within-Study Comparisons of Age at Which Intervention Begins[a]

	ES	S_{es}	N_{es}
Effect Sizes From Unconfounded Studies	-.04	.08	17
Effect Sizes Confounded with Other Variables (e.g., intensity, setting)	.16	.06	101

[a] Data based on 8 studies.

Taken together, these data raise questions about the commonly held position that "earlier is better." Unfortunately, very little evidence is available, and most is for disadvantaged rather than handicapped children. Furthermore, no direct comparisons came from studies with high ratings of methodological quality. Most disturbing is that in spite of the frequently stated position that "earlier is better," very few empirical studies have even addressed the issue of time at which intervention begins.

Conclusions from Previous Research

Where does all this leave us with respect to early intervention for handicapped, disadvantaged, and at-risk children? First, the paucity of available empirical data--particularly from well designed studies--for many of the most important questions is disconcerting. Contrary to the conclusions of many previous reviewers and textbook authors, there simply is not enough information to be confident about the long-term impact of early intervention with handicapped children, and evidence in support of many of the commonly held positions about mediating variables (e.g., parental involvement, age at start) is either nonexistent or contradictory.

Second, there is strong support for the immediate positive effects of intervention with disadvantaged children and emerging support for long-term benefits. Furthermore, data are beginning to accumulate which support the immediate benefits of intervention for handicapped children. More research, particularly longitudinal research, is absolutely essential, however, to guide both policy and practice.

Most relevant to the design of future studies is the need identified from this analysis for higher quality research. A number of other investigators have lamented the ambiguity caused by methodological flaws in early intervention efficacy research (Dunst & Rheingrover, 1981; Simeonsson, Cooper, & Scheiner, 1982). Fortunately, some of the most serious problems with previous studies are reasonably resolvable. First, in spite of the difficulties involved, and as discussed in more detail in a later section, the use of randomized designs in early intervention efficacy research is neither unethical nor impossible. Random assignment to groups is especially feasible and advantageous in those cases in which the number of families in need of services far exceeds the capacity of service agencies to provide comprehensive services or in those cases in which alternative treatment programs are being considered.

A second relatively simple procedure which would substantially improve the quality and credibility of early intervention efficacy research would be the use of data collectors who are unaware of the group membership of subjects. Only 21% of the effect sizes included in our analyses came from studies in which the data collector was definitely "blind." Unfortunately, the educational and medical literature is rife with examples of ineffective or even harmful treatments that have been advocated by well-intentioned people who believed that their treatment was making a difference. We need not look far to see examples of people seeing what they expected to see, such as dietary treatment of hyperactivity, Doman Delacato therapy for learning-disabled children, or even blood letting in the not-too-distant past. The use of "blind" data collectors would eliminate this serious threat to the credibility of study results.

Another serious problem with previous research is that virtually all the existing early intervention efficacy research has failed to determine the extent to which the intended treatment was actually implemented. For example, in programs which intended to use parents as interveners, our analysis of previous research identified virtually no instances of evidence that parents actually did become involved to the degree intended by the program designer. Unless such information is obtained, there is a real danger that comparisons are being made between programs which were intended to be different, but were not. The failure to verify that intended treatments were actually implemented may be responsible in part for the failure of previous research to detect differences among alternative intervention programs.

Finally, it is necessary to pay more attention to making sure that there is symmetry between the outcomes assessed and the goals of the intervention. The specific nature of the intervention program should in large part dictate the outcome measures that are selected. Because resources for research are always limited, investigators should put first priority on measuring those outcomes which are most central to what their intervention is expected to accomplish. For example, some interventions have focused primarily on enhancing social and emotional functioning, but have limited their assessment to measurements of IQ. Because there is a substantial interrelationship among the multiple lines of development, differences in IQ may have been found. But these differences are probably much weaker than they would have been if measurements had been taken on those behaviors and competencies directly targeted by the intervention.

Our analysis of previous early intervention research clearly supports need for more high-quality research on the issues outlined by the government for the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children** (i.e., intensity of intervention, age-at-start, and program variation, particularly parent involvement). The government's requirement that all of these studies be done using randomized experiments deserves further discussion in light of the very strong objectives to randomization raised by many early intervention professionals.

Ethical, Practical, and Scientific Considerations of Randomized Experiments in Early Childhood Special Education

During the last 20 years, a variety of research methods have been used to determine whether some types of early intervention are more effective than others (e.g., Balow & Brill, 1975; Miller & Bizzell, 1983; Nelson & Evans, 1968; Strain, 1975). Recognizing that different research methods have merit, we argue here that one particular methodological technique--randomized experiments--has been underused in collecting data about the efficacy of various forms of early intervention. In doing that, we examine some of the most frequently used arguments for not using randomized experiments, and support the decision of the Federal government to require the use of randomized experiments in the **Longitudinal Studies.** The term "randomized experiments" will be used to refer to those studies which use a process of randomly assigning subjects to experimental groups (i.e., ensuring that every subject has an equal chance of being in any group). Such a procedure increases the probability that groups will be comparable on all variables that might affect the outcome except for group membership.

As an example of a randomized experiment, consider the recent case of a new drug, propranolol, which was alleged to prevent reoccurrence of heart attacks (Beta--Blocker Heart Attack Trial Research Group, 1982). To determine the efficacy of this particular drug, almost 4,000 patients who had previously suffered at least one heart attack were randomly assigned to one of two groups. One group received propranolol, the other did not. After an average of 25 months of treatment, the mortality rate from new heart attacks was 26% lower in the propranolol group than in the comparison group. Because the only systematic difference between the two groups was that one had received propranolol and one had not, the difference in mortality rate was attributed to the drug.

Obviously, the use of randomized experiments is not the only way to establish a cause and effect relationship (e.g., it is now well accepted that smoking is causally related to lung cancer even though randomized experiments have not been conducted), but it is one of the most efficient methods and has been used successfully in many areas of social science and health. Such research has demonstrated the ineffectiveness of many otherwise popular treatments (e.g., dietary treatments of hyperactivity, Spring & Sandoval, 1976; cell therapy for Down syndrome children, Pruess & Fewell, 1985; the use of laetrile in cancer therapy, Newell & Ellison, 1980; and Doman Delacato treatments for learning disabled children, Glass & Robbins, 1967). In many other cases, randomized experiments have established the benefits of a particular treatment (Mosteller, 1981)--even in cases where the value of the treatment was not particularly obvious (e.g., the effectiveness of fluoride in reducing the incidence of dental caries [Blayney & Hill, 1967]; or the fact that trained paraprofessionals can provide certain services as effectively as professionals [Durlak, 1979; Pezzino, 1986; Shortinghuis & Frohman, 1974]).

In spite of the historically demonstrated value of randomized experiments, many early childhood special education researchers, practitioners, and administrators have suggested that such designs are inappropriate for early intervention research (e.g., Bricker, Bailey, & Bruder, 1984; Dunst & Rheingrover, 1981; Odom & Fewell, 1983; Seitz, 1983; Simeonsson, Cooper, & Scheiner, 1982). The most frequently cited arguments can be summarized in three broad and somewhat overlapping categories.

The first argument suggests that randomized experiments are unnecessary because the information necessary to decide which types of programs are best for a particular group of children is more easily available from other sources. The second argument is that randomized experiments are impractical due to a wide variety of logistical, political, and technical difficulties. And, finally, it is argued that randomized experiments are unethical and probably illegal because the process of randomization requires that needy people be denied treatment or assigned to an undesirable treatment.

In what follows, we will argue that there are many instances in which each of these objections is incorrect, and that randomized experiments are valuable and should be more widely used. Although randomized experiments should not be the only method of investigating the efficacy of various forms of early intervention, the very infrequent use of randomized experiments in early childhood special education has been a serious impediment to the advancement of knowledge about the efficacy of early intervention.

Are Randomized Experiments Necessary?

Two related arguments are used to defend the position that randomized experiments are unnecessary. First, even though opponents agree that such experiments would provide good information about effectiveness, they argue that other methodological techniques are adequate and easier to implement. Second, it is argued that even though none of the existing data are perfect, the combined weight of so much evidence is sufficient for making decisions. These two arguments are discussed below.

There are other ways of knowing. Obviously, causal inferences can be made confidently in many instances without data from a randomized experiment: A particularly strong wind topples a tree, or an earthquake causes a building to crumble. Because there are no plausible alternative explanations, it would be foolish to argue with the validity of the causal inference. However, in comparing the relative effectiveness of particular types of early intervention, alternative explanations abound and serious mistakes are sometimes made.

Professional judgment or common sense is probably the most frequently used basis for arguing that a particular type of intervention is best for a specific group of children. It is primarily on this basis that people have argued that intervention should begin as early as possible, that parents are the key to effective intervention, and that more comprehensive or intensive programs result in greater benefits (Mastropieri, White, & Fecteau, 1986).

Fortunately, professional judgment is often correct and has led to significant advances. Occasionally, however, over-reliance on professional judgment leads to serious mistakes. One of the most dramatic examples comes from the late 1940s, when technological advances in incubators for low birthweight babies made it possible to systematically monitor the amount of oxygen provided to such infants. Because respiratory distress was the highest cause of morbidity and mortality among such infants, it was reasoned that increasing the concentration of oxygen would result in better outcomes. Encouraged by anecdotal reports and the compelling logic, hospitals across the country began the practice. Within a short time, incidence of retrolental fibroplasia (which leads to blindness) increased dramatically among such infants. Some suggested that the increased exposure to oxygen was responsible. However, this possibility was initially rejected because it was counter-intuitive that something as essential as oxygen--particularly in the presence of such high rates of respiratory distress--could be harmful. Eventually, randomized experiments were conducted and it was conclusively demonstrated that oxygen was the culprit (Gordon, 1954).

Such errors are not isolated occurrences. Gilbert, McPeck, and Mosteller (1977) examined all randomized experiments of major surgical and anesthetic innovations reported in INDEX MEDICUS between 1964 and 1973 (n = 36). Because of the life-threatening nature of the problems being treated, all of the innovations were supported by a great deal of professional judgment, anecdotal evidence, and correlational data prior to implementation of the randomized experiment. Nevertheless, the results of the randomized experiments indicated that more than half of the innovations were actually worse than the standard technique to which they were compared. Eleven percent were equally as good and thus provided an alternative approach that might be useful in specific circumstances, while only 33% were actually better. From these examples, it is clear that even though professional judgment is valuable, it should not be the sole means of deciding the relative merit of different treatments.

Correlational research is sometimes suggested as another alternative to randomized experiments, and many important causal relationships have been established on the basis of such research (e.g., the relationship between cholesterol and heart disease). However, before deciding that correlationship research is preferable to randomized experiments for a given issue, one should consider the tedious exclusion of alternative explanations required to make causal inferences from correlationship data. Unless such work is done, correlational research can lead to seriously inaccurate conclusions.

For example, a study of the correlation between amount of psychotherapy and measures of psychological well-being might conclude that psychotherapy is harmful because those patients who receive the most psychotherapy are least healthy. A more plausible explanation is that those people who only have minor problems progress relatively quickly and thus receive very little psychotherapy. Only the most severe cases receive extended therapy, and those cases are least likely to show dramatic progress. Similar examples abound. Sick people are most often found in hospitals, but not because hospitals cause sickness; and students who receive tutoring generally receive lower grades than untutored students, but not because the tutoring is detrimental.

The problems cited above with using correlational data are obvious, but in many cases, the problems are more subtle. For example, much of the support for the position that "earlier is better" in early intervention programs comes from correlational research (e.g., Bricker & Dow, 1980; Casto, 1978; Maisto & German, 1979). However, it may be that the association is due to other factors that covary with both progress and the age at which intervention begins. Such factors might include the fact that well-educated, highly motivated parents are more likely to identify problems and seek out intervention earlier; but they are also more likely to work with the child on their own and provide a more nurturing environment. Thus, additional progress might be made by such children as a result of the extra attention of more competent parents, rather than the earlier start in an intervention program.

Another alternative that is frequently proposed by those who believe that randomized experiments are unnecessary is some type of quasi-experimental design in which nonrandomized groups of children are compared. In the best of such studies, the researchers attempt to ensure that the groups are comparable on all variables except the variable being investigated, either through matching the groups on what are thought to be relevant variables or by some means of statistical adjustment. Although such matching and/or adjustment is theoretically possible, it is extremely difficult to do in practice. Campbell and Boruch (1975) noted that when using nonrandomized experiments one must make assumptions that are:

> Often untenable and even more frequently unverifiable. In addition, a melange of parameters must be identified and estimated based on insufficient theory and data. These two problems in themselves are sufficiently formidable...to justify eliminating them at the outset, by assuring through randomization that groups are identical to one another with respect to unknown parameters. (p. 208)

Problems with using nonrandomized experiments to draw conclusions about the effects of early intervention have been noted by Dunst and Rheingrover (1981) and Simeonsson et al. (1982). White, Mastropieri, and Casto (1984) have given more detailed examples in their analysis of the 21 early intervention projects approved by the Joint Dissemination Review Panel for national dissemination. White et al. (1984) concluded that even though such projects have made a substantial contribution to the field by demonstrating the feasibility of early intervention and by developing and disseminating curriculum materials and assessment instruments, one could conclude little about the efficacy of early intervention from these project reports due to the serious methodological weaknesses.

Some people have assumed that clever statistical manipulation could be used to make the same inferences from quasi-experiment designs as one might make on the basis of randomized data. The problems with such approaches have long been recognized and repeatedly discussed (Campbell & Boruch, 1975; Fisher, 1935; Smith, 1957; Wold, 1956), but the thought persists. The dangers of such an approach are nowhere more evident than in the Westinghouse evaluation of Head Start (Cicirelli, 1969), in which analysis of covariance was used to correct for nonrandom differences between the comparison groups. As Campbell and Erlebacher (1970) pointed out, the adjustments seriously underestimated the effect of Head Start and resulted in indefensible and incorrect conclusions.

We already know what works. A frequently advanced argument is that we already have sufficient data to demonstrate both the overall effectiveness of early intervention programs and the relative effectiveness of different types of programs. As stated in the foreword to a recent publication by the National Center for Clinical Infant Programs, "We've *had* the demonstration projects. Now how can we take what we've learned and get services to all disabled and at-risk children . . . starting at birth?" (NCCIP, n.d., p. 2, emphasis in original). Unfortunately, there is very little empirical support for this position. As already shown, the strategies used to collect much of the early intervention efficacy data for handicapped children suffer from methodological weaknesses; thus few conclusions can be drawn.

Are Randomized Experiments Practical?

A frequent argument against the use of randomized experiments is that even though they would provide useful information, administrators, service providers, and parents would never allow such experiments to be conducted in conjunction with early intervention service programs. The alleged opposition to randomization would occur because nobody would agree to participate in a study where they knew that some people would be denied services or that some would be receiving less effective services. Both logic and experience suggest that the difficulty of getting people to participate in randomized experiments may be more imagined than real.

At the present time, handicapped children are arbitrarily provided with varying dosages and types of early intervention based primarily on the biases of the administrator or what is popular and/or affordable in that particular area. Some handicapped preschool children receive home-based intervention, some receive center-based intervention, and some receive a combination of center- and home-based intervention. Some are given a highly structured teacher-directed curriculum, while others are given a more child-directed humanistic curriculum. Some children attend intervention for 5 days a week, others are visited as little as once a month. These variations are not completely explained by the type and severity of the handicap, the age of the child, or preferences of the parents. In other words, the type of intervention provided to children is constantly varied as a function of the experiences, biases, and resources of individual service providers.

The situation described above lends itself to the use of randomized experiments. Furthermore, the fact that there are not enough early intervention services to go around, coupled with the absence of certainty about what type of program is most effective, creates a situation in which randomized experiments are a feasible and appropriate way for deciding who gets what.

One of the easiest situations for randomized experiments is where there is not enough of the treatment for everybody to participate. Consider the Salk poliomyelitis vaccine trials, in which some children were given the vaccine while others were given an inert saline placebo. All children could not be given the vaccine because it was impossible to produce enough vaccine during the first year. To have made the allocation of vaccine on a first-come, first-serve basis would have discriminated against less well-educated families, because they would not have been aware of the availability of the vaccine. Thus, the creation of randomized experimental and control groups was not only an example of an equitable allocation of a scarce resource, but it also provided definitive information about the efficacy of the vaccine.

Such examples are not limited to the medical field. In his application to the Joint Dissemination Review Panel for national validation, Hainsworth (n.d.) reported data for a project in which 23 moderately to severely handicapped preschoolers were available and met the established criteria for an intervention project. Unfortunately, the project only had enough resources to serve 12 of the 23 children. Instead of randomly assigning children to experimental and control groups, the project selected the 12 children with the most severe problems on a criterion-referenced instrument and provided services to those children. Because of problems with statistical regression, the results of the study are difficult to interpret (see White et al., 1984, p. 22).

The rationale for not conducting the randomized experiment was that the project was obligated to serve the most needy children first. However, since all of the children met the established criteria for receiving project services, it is unclear why a questionable measure of "need" should be used to decide who would receive services. Perhaps those children who scored highest on the test would have benefited more than children who scored lowest. Would not random assignment of children to groups be just as defensible as selection based on the criterion-referenced instrument? Furthermore, such assignment would have increased the probability of obtaining defensible information about the effectiveness of the project.

The practicability of randomized experiments is also supported by the fact that there are a number of examples of such experiments in early intervention research. In their analysis of over 200 early intervention efficacy studies, researchers at Utah State University's Early Intervention Research Institute have identified over 82 randomized experiments. As shown in Table I.5, most of the studies have been done with disadvantaged children, and a higher percentage have compared one type of treatment to another type of treatment, as opposed to treatment versus no treatment comparisons. However, these data offer evidence that such studies are possible. In fact, some of those studies which have had the greatest impact on the field (e.g., the North Carolina Abecedarian Project [Ramey & Haskins, 1981]; and the Perry Preschool Project [Weikart, Bond, & McNeil, 1978]) were randomized experiments.

Table I.15

Number of Studies in Early Intervention Research Institute Meta-Analysis Data Set That Used Randomized Designs

	Disadvantaged	At-risk	Handicapped
Treatment vs. No Treatment	37 or 95 studies (38%)	4 of 10 studies (40%)	9 of 74 studies (12%)
Treatment A vs. Treatment B	25 of 58 studies (43%)	4 of 8 studies (50%)	14 of 47 studies (30%

Note: Total data set includes information for 234 unique studies. Four studies reported information separately for two groups of children (e.g., handicapped and disadvantaged). Many studies reported information for both treatment versus no treatment, and A versus B comparisons; so the sum of the categories in each column will be more than the number of unique studies.

Program administrators often argue that parents will not agree to participate in randomized trials, but there is evidence that this may not be true for all parents. In four studies conducted at the Utah Early Intervention Research Institute (on treatment versus no-treatment study, and three comparisons of different types of treatment), acceptance rates by parents to the condition of random assignment ranged from 90% to 98% (Mehran & White, 1986; Peterson, Casto, & Lindauer, 1985; Pezzino, 1986; Pezzino & Bradley, 1986). Similar figures have been reported by Ramey (1985) for his Abecedarian and CARE projects and by Gross (1985) for the Infant Health and Development Project, all of which compare two levels of treatment. Such high acceptance rates suggest that it is practical to conduct randomized experiments.

Are Randomized Experiments Legal/Ethical?

Random assignment of children to treatment versus no-treatment groups or to comparative treatment groups would be unethical in those situations where there is proof that one treatment is superior and sufficient resources for that particular treatment are generally available in similar circumstances. As discussed below, neither of these conditions is met in most early intervention settings.

Knowledge about what works best. The most important condition is that unequivocal information is available about what works best. Many people rely on professional judgment for making such decisions. However, professional judgment is sometimes incorrect about what is best in a given circumstance. The example described earlier about high concentrations of oxygen for premature low birthweight babies is one of the most obvious examples, but it is not an isolated occurrence. Consider the following two examples; one from medicine, and one from early childhood education.

Gilbert, Light, and Mosteller (1975) described an experiment to determine if a major contributor to skyrocketing medical costs was the fact that insurers would only pay for work done in the hospital. It was hypothesized that inpatient services (which were relatively more expensive) were being used in instances where outpatient services would have been just as good, and that substantial savings would result if insurers would pay for outpatient services in cases where it could be appropriately substituted for inpatient services. An experiment was conducted in which 15,000 people were randomly assigned to a group in which the outpatient benefits were added on a trial basis, or to a group in which the regular program remained in effect. The results were completely contrary to expectations. Medical costs for the group with the added outpatient benefits rose by 16% while those for the group with regular benefits increased by only 3%. Both logic and professional judgment were incorrect.

There is also evidence in early childhood special education programs that we do not yet have all the answers about what types of programs are most effective. One specific example from among the many available is given here. In a study conducted in Great Britain (Sandow & Clarke, 1978; Sandow, Clarke, Cox, & Stewart, 1981), children were divided into matched groups in a quasi-experimental design in which the first group received a home-based intervention program with individual visits at 2-week intervals. The second group received a similar home-based intervention program but subjects were visited only once every 8 weeks, and the third group received no intervention. It was hypothesized that the more frequently visited group would make the greatest gains. Contrary to expectations, the group visited least frequently did the best.

Standards for what constitutes adequate intervention are generally based on intuition, collective wisdom, and/or clinical judgment, only some of which is correct. Consider the hypothetical situation in which half-day, center-based programs are provided to 3- to 5-year-old handicapped children, but there are not enough resources to serve all handicapped children in the catchment area. Consequently, services are provided to those who sign up first and others are put on a waiting list. Unfortunately, the position that a certain minimal level of services must be provided (in this case, 5 half-days each week) is seldom based on any sound empirical data. It may be that a 3-day-a-week intervention program or a home-based program in which visits are made to each family once a week would be just as effective. If the more limited program was just as effective, additional children could be served. Consequently, some children may be going without services because the service provider is insisting on meeting a "standard" for which there is insufficient evidence.

Availability of sufficient resources. When sufficient resources are not available to provide early intervention services to all children, programs are typically provided on either first-come, first-served, or to those children who are "most in need of help." Generally, once the available slots are filled, no further effort is made to identify children in need of services because it is argued that it would be unethical to identify the children and not provide them with services.

As an example of the problems with this type of an approach, consider a hypothetical situation in a state with virtually no publicly funded intervention programs for handicapped 0- to 3-year-olds. The state estimates that there are at least 600 children from 0- to 3-years old with established handicaps in a given county who are not receiving services. The state offers to provide enough money to develop and implement an early intervention program for 100 children. If it can be demonstrated that the program is effective, the budget will be expanded. From a historical perspective, we can predict what would happen. Most people would take the money, identify 100 children, collect pretest and posttest data, and on the basis of that data, argue that the program had been effective.

Not only is such an approach bad science, but it is no more ethical than to identify 200 children, randomly assign 100 to receive services, and use the other 100 as a control group. Arguing that such a design would deny services to the 100 children in the control group ignores the fact that those same children would have gone unserved using the first approach. In fact, by participating in the randomized experiment, control group children actually receive more services since they are regularly given developmental assessments. Serving subjects on a first-come, first-served basis also biases the acquisition of services towards those families who are better educated, more active in the community, and better informed. In fact, Campbell (1969) has argued that the random allocation of services is the most democratic and moral means of allocating scarce resources, since a first-come, first-served policy perpetuates social inequality.

The other argument used in allocating scarce resources is that those who are most in need should receive the resource first. This argument was used in the Hainsworth (n.d.) study referred to earlier, in which 23 children were identified as meeting the criteria for receiving services. The 12 children who were most severely handicapped were selected to receive the services. Such an approach ignores the fact that very little is known about what type of children benefit most from early intervention services. Perhaps with this particular program, severely handicapped children would make no progress. If that were true, it is difficult to argue that only the severely handicapped children should be served while the moderately handicapped children are left unserved. One way of determining which children profit most from services is to conduct randomized experiments. Unfortunately, very little such work has been done.

Conclusions About Randomized Experiments

There is still much to learn about the relative benefits of different types of early childhood special education services for handicapped children. Because professional judgment and intuition are sometimes incorrect, it is crucial that we continue to collect data about such issues. Recognizing that many types of data will be useful, researchers and administrators should rely more frequently on the results of randomized experiments. Such experiments can take us beyond common sense knowing; not by replacing it, but by depending and building upon it. Conducting randomized experiments in early intervention is one of the most efficient and feasible ways of producing credible and replicable results, and the typical objections to such experiments are without basis in many instances.

Benefits and Procedures for Economic Evaluations

Even more infrequent than the use of randomized experiments, is the systematic consideration of costs in conjunction with early intervention research.

From an economic perspective, early intervention is an investment in the lives of children with handicaps and their families. Despite popular belief in the "cost-effectiveness" of early intervention programs, relatively few economic analyses have been conducted. As of 1987, only 16 economic analyses had been conducted in early intervention studies that included young handicapped children, and the majority of these were methodologically problematic (Barnett & Escobar, 1987, 1988). If research is to inform policy and assist the practical application of early intervention, the short- and long-term costs and benefits of programs generally and of specific alternative approaches need to be fully understood and documented. Economic research at EIRI has focused upon establishing criteria for conducting economic analyses of early intervention programs that adhere to economic conventions, developing new methods to address problems specific to early intervention research (Escobar, Barnett, & Keith, 1988), and conducting new economic analyses of early intervention. The remainder of this section presents a brief overview of economic analysis for early intervention program evaluation for those unfamiliar with its methods and terminology.

The primary purpose of economic analysis is to assess **economic efficiency**. An early intervention program that is economically efficient produces a greater gain than loss (net gain) to society as a whole. Efficiency is always assessed comparatively; the most efficient program is the one with the greatest net gain. Economic analysis can also be used to assess **equity** by describing the distribution of costs and benefits of a program. However, the purpose of economic analysis with respect to equity is purely descriptive because there are no economic criteria of equity. Consumers of the analysis are left to rely on their own values to judge the fairness of the distributional consequences.

Two types of economic analyses are most relevant to the longitudinal research studies: cost-benefit and cost-effectiveness analysis. Cost-effectiveness analysis (CEA) is a way to investigate the relationship between the costs and outcomes of one program compared to those of one or more alternative programs: The dollar value of the resources that go into the program are estimated and compared to outcomes. CEA is most useful in considering alternative strategies to address the same problem.

Programs can be compared on how much they accomplish with each dollar invested in them.

The comparison of costs and effects differs between cost-effectiveness (CE) and cost-benefit analysis (CBA). CE analysis uses a series of matrices that display the costs and effects of each intervention. A hypothetical cost-effectiveness matrix is given in Table I.6. Such a matrix displays the relative strengths and weaknesses of each of the interventions in an easily read format. Program C, for example, is associated with more motor skills and positive responses than are programs A or B. However, Program C has higher costs and lower developmental quotients (DQs). The matrix approach allows several different comparisons to be made on program costs and effects. For example, costs can be separated by the groups bearing the expense of the resource, or effects can be displayed according to the type of handicap, severity of handicap, or age served.

Table I.6
Hypothetical CE Matrix for DQ, Motor Skills, and Positive Responses Across Three Interventions (A, B, C)

	Cost Per Child			Effects			
	Total	Parents	Project	DQ[a]	Skills[b]	Responses[c]	Satisfaction[d]
A	1,050	550	500	3	12	15	4
B	1,750	1,400	350	9	5	4	5
C	1,800	600	1,300	0	20	17	9

[a] Mean gain in DQ
[b] Mean number of skills mastered
[c] Mean number of positive responses in one trial
[d] Mean satisfaction-with-program score on a 10-point scale where 10 is positive and 1 is negative

This analysis and display procedure is used instead of the direct computation of simple cost-effectiveness ratios for several reasons. First, it may be inappropriate for the evaluators to decide which cost breakdowns and effects are the most important. For instance, some persons may value parent satisfaction more highly than others. Some may value gains in DQ much more highly than anything else. In another instance, a CE comparison disregarding parent time may be desired (if one wants to know what is feasible based on public school resources, for example). The ultimate cost-effectiveness comparisons must be left to the decision-making body. Second, this format displays the distribution of the intervention costs and effects. For example, in Table I.6, the parents in Program B bear more of the costs than do parents in Program A or C. However, the parents in Program C report higher satisfaction than parents in Program A or B. This disaggregation provides decision-makers with valuable information about political and social impacts of the program and potential disincentives or incentives to parent participation. Third, the matrices are easily comprehended by readers without an economics background. Thus, the data are available to a wide audience, increasing the usefulness of the cost-effectiveness data. Fourth, cost-effectiveness ratios do not provide a reliable ranking of programs in terms of economic efficiency (Barnett, 1986).

Cost-benefit analysis (CBA) is a way to compare the dollar value of a program's benefits (outcomes) to the dollar value of its costs. In addition to the complete estimation of program costs, CBA requires the comprehensive measurement of program effects and, whenever possible, an estimation of their monetary value. CBA is often only partially completed because many program effects are intangible and, thus, difficult to value in a monetary sense.

Cost-benefit analysis is most germane when the economic implications of outcomes can be readily estimated. For instance, a program which reduces the need for special education or expensive therapy produces benefits to society that can at least be roughly estimated. Because the process of estimating the dollar value of intervention outcomes is almost always incomplete, it yields a conservative estimate of the net economic return to society. However, such analyses can be accomplished to a much greater extent than often supposed, as demonstrated by the economic analysis of the Perry Preschool Project (Barnett, 1985a 1985b). For early intervention research, three types of measures can be used to quantify the benefits of early intervention.

> Savings in costs of care and education. One measure of benefits is the cost savings that are generated by increasing the capacities of handicapped preschoolers, or improving the efficiency of the service delivery system. These cost savings may derive from: organizational, procedural, or staff changes that reduce intervention costs; a reduction in the intensity or duration of later special services; or an intervention that provides a better transition to later services and so increases productivity or reduces cost. For example, the Perry Preschool Study analyzed cost savings in education and social services (Barnett, 1985a; Berrueta-Clement et al., 1984). Significant cost differences were observed as early as two and three years after the intervention. Seitz, Rosenbaum, and Apfel (1985) found similar kinds of educational savings from an intervention program that focused on families and began at birth.
>
> Cost savings to households. Families with handicapped children have substantially higher child-related expenses of time and money than do families without handicapped children. This applies to many ordinary activities as well as to special activities not required for non-handicapped children. One way that we can measure cost savings is to compare time use and out-of-pocket expenditures for sample families participating in interventions.
>
> Willingness-to-pay by households. The most complete benefit estimation procedures estimate the value of an intervention program and its effects to families beyond the cost savings discussed above. The techniques used to produce more complete estimates of benefits are generally classed as either (1) "hedonic" approaches or (2) direct measures of willingness-to-pay. The hedonic approach involves the estimation of a "household production function" based on expenditures of money and time by household members on various goods and services (Lancaster, 1966), or the identification of differing prices or wages accepted in order to participate in the activity. Estimation of a household production function can involve difficult theoretical and empirical problems and requires relatively large amounts of detailed data collection from families (Barnett, 1977; Barnett, 1983; Muellbauer, 1974; Pollack & Wachter, 1975).
>
> The second approach to valuation, direct elicitation of willingness-to-pay through "bidding games," might also be successfully applied to early intervention programs and their effects. However, strategic and other biases which are often suspected in hypothetical responses may be a problem. Also, it is sometimes difficult to elicit responses from individuals in cases where very detailed descriptions of the "game" must be used; this would be the case for valuing specific treatment variations in intervention components. The economic analysis staff have developed possible solutions to these problems, however, and have had some success in using this approach. For example, Escobar, Barnett, and Keith (1987) were able to obtain reasonable estimates of parents' valuation of a preschool program for handicapped children. These estimates were highly consistent with predictions based upon economic theory. We have been

experimenting with the form of survey used to collect data in several "pilot" sites.

Collection of cost data. Economic analysis requires that the components of each alternative treatment be clearly specified. Procedures for collecting detailed data have been developed, tested, and implemented at all of the study sites. Using all available sources (e.g., written documents and interviews with project staff), a detailed description was drawn up for each intervention. Descriptive data include: (a) number of children by age, handicap, severity, and developmental level; (b) number of direct service staff, administrators, and volunteers; (c) other resources used in the intervention program; and (d) type and extent of parent involvement. These data are combined with information on the unit costs of resources to produce estimates of total program cost and cost per child.

The primary reason that economic evaluation requires a specialized cost data collection system is that project budgets usually do not accurately reflect the total costs of a program. For instance, the value of parent time is not included as a cost. Yet, the care and education of a handicapped preschooler requires extraordinary amounts of a family's resources, especially parent time, under any circumstances. Parents with handicapped children who participate in interventions may be expected to contribute significantly greater amounts of their time than other parents. Indeed, parent participation in development of the individualized education plans alone may consume nontrivial amounts of time. These time costs are important for more than economic comparisons; if time costs are sufficiently high, they may be a barrier to participation for some parents, in particular low-income, single parents. Other resources that are frequently not found in budgets are the costs of initial staff training and set-up for a new program, "borrowed" staff, volunteers, and even facility costs. To overcome the problems with using budget figures, the costs of implementing each of the interventions studied are defined and measured using the "ingredients" method proposed by Levin (1975, 1983).

The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or estimated market values (e.g., parent time). In some cases, it is necessary to prorate shared costs of a resource; for example, by estimating the proportional costs to one program using a building that is shared with another program. Costs are then distributed according to constituencies, adjustments are made for transfer payments (transfer payments are shifts in income like taxes and welfare payments that are not net costs to society as a whole) and total net costs are calculated. Using this approach, it is possible to ascertain the overall costs for each alternative program as well as the costs to various contributing groups.

Since the concepts and skills involved in economic analysis are relatively new, most site staff were unfamiliar with the procedures. We have developed, tested, and revised the cost data collection forms so that they do not require a background in economic analysis to generate accurate cost data. EIRI economists were available for assistance in computing the forms. The forms were referred to EIRI for analysis and further interaction with the site if any problems or inconsistencies are noted. Described below are the general resource categories that have been used for each site. Refer to individual sites for overall costs and cost per child for each of the following resource categories:

Personnel - Cost for program personnel is divided into direct service, administrative, consultants, volunteer, and parent time costs. Direct service and administrative costs include salary plus benefits according to the portion of FTE devoted to the alternative early intervention programs. Consultant time was calculated based upon their daily rate. Volunteer and parent time was valued at $10.50 per hour, the U.S. average wage plus benefits (U.S. Department of Labor, 1986).

In most cases, parent time is based upon the number of hours parents were required to commit to the programs, for attending center- or home-based programs, or in phone calls with program staff. Although we know that most parents conducted intervention activities at home with their child, we usually did not attempt to estimate how much time was spent because too much uncertainty was involved. However, for those programs that outlined specific home intervention activities for parents to carry out, we did estimate parent time based upon the time recommended by the program. Thus, we provided an estimate of how much time parents would have spent if they adhered to the program at home. In all cases, we provide program cost estimates with and without the value of parent and volunteer time.

Capital assets - Facilities, vehicles, equipment, and other investments in items with more than a 1-year life are capital assets. Their costs need to be apportioned to the relevant time period (e.g., 1987-88 school year). Annual capital costs were estimated in one of three ways: (1) the replacement cost of the capital was determined and then multiplied by an annualization factor that accounted for implicit interest and depreciation on the item (Levin, 1983); (2) annual rental cost was used; or (3) the indirect rate (for intervention programs housed in universities) was used.

Transportation - Annual staff and child transportation costs were reported by each early intervention program. Staff travel included any job-related travel paid for by the program, such as home visits, travel between centers, any air travel, and consultant travel. Child transportation may or may not have been program-provided. Parents who used their own resources to transport their child or themselves for intervention services were phone interviewed. In the interview, they were asked the round-trip distance they were required to travel, the number of trips made, travel time, and whether or not they car-pooled. Based upon this information, parents' transportation costs were estimated at $.21 per mile and $10.50 per hour. In all analyses, transportation costs are estimated with and without parent costs.

Materials and supplies - Each program reported annual expenditures on consumable items (expected life of 1 year or less). This included office, classroom, and custodial materials and supplies.

Miscellaneous - Includes annual expenditures on anything not counted elsewhere. May include utilities, insurance, debt service, dues, subscriptions, etc.

The Design of the Longitudinal Studies

Based on the results of our analyses of previous early intervention research and consistent with the requirements of the RFP, a series of longitudinal studies were designed to investigate the effects and costs of early intervention with handicapped children. This section summarizes the design and organization of those studies.

The longitudinal studies to be conducted by the institute are designed to (a) increase the knowledge base concerning the efficacy of early intervention with handicapped children in order to improve current service programs, (b) provide information about the cost-effectiveness of various alternative interventions as a basis for policy decisions, and (c) demonstrate the feasibility and utility of conducting experimental longitudinal research in collaboration with typical service providers.

The questions to be addressed, the specific research projects to be conducted, and the outcome measures selected have been developed in accordance with what is often referred to as the General Systems Model (Ramey, McPhee, & Yeates, 1982). We believe that some of the research on the efficacy of early intervention has been hindered by overly narrow views of development and the resulting simplistic models of causality that have been applied to intervention programs. Environmentalists, hereditarians, and proponents of the medical model have tended to emphasize a unitary relationship between an initial problem (e.g., deprivation) and a later outcome (e.g., school failure). Dissatisfaction with such models led to the development of more sophisticated interactive approaches such as Sameroff's (1975) transactional model and Bronfenbrenner's (1974) ecological model of human development which emphasized bidirectionality of cause and effect and consideration of a broad range of outcome domains.

The General Systems Model is consistent with these earlier bidirectional models but expands upon them by suggesting the following principles:

1. The developing infant is the product of a variety of "systems" (e.g., immediate family, neighborhood, school) which are in constant interaction with each other. Each system functions at a variety of levels. Complex interactions occur within and across levels, as well as between systems.
2. Each unit within a system seeks to maintain equilibrium. A self-righting mechanism serves to bring a unit back into equilibrium. However, in the case of a handicapped infant, outside resources may be necessary to restore equilibrium.
3. Development is characterized by plasticity. The infant acts on the environment at the same time that the environment is acting upon it. This interaction process is complex and bidirectional.

The General Systems Model takes essentially a psychobiological perspective on development because the genetic potential of the infant is seen as being affected by a wide variety of environmental factors. Furthermore, systems theory holds that interventions should have child, family, and environmental emphases, and that outcome measures should be selected which reflect these broad emphases.

Systems theory provides an excellent frame work for organizing the series of longitudinal studies to be conducted. Because of the common elements and design characteristics of the various studies, results can be combined across studies to address common hypotheses or can be considered separately. Furthermore, by viewing the child's development as the result of a variety of interacting systems, we will be able to examine how mediating variables (e.g., family socioeconomic status, involvement of extended family members, utilization of community resources) interact with and contribute to intervention effectiveness.

Major Questions to be Addressed

The workscope of the institute consists of a series of interrelated studies initiated in the Fall of 1986. The design and procedures for these studies are based on the results of a series of feasibility studies conducted during 1985-86. The studies can be divided into three categories as described below.

Immediate and long-term effects of intervention. The first series of studies will address the need for objective data on the immediate and long-term effects of providing early intervention to children who either are currently unserved or are receiving minimal service. In each study, a comprehensive service program has been developed for half of the children, and the effects of participating in either the existing program or the more comprehensive is being assessed. For example, in one study described in more detail later in the report, 60 moderately to severely handicapped children were identified in a program in Illinois which was providing one day per week of center-based services. Using money from a grant funded by the state of Illinois, half of the children were randomly assigned to receive services three times per week. The nature and organization of the services was the same but one group of children received three times as much.

Effects of beginning intervention at different ages. Another relevant issue with respect to early intervention is the determination of the most appropriate age at which services should begin. In another set of studies, groups of underserved handicapped children have been identified. A more comprehensive service program was developed, similar to the study described above. Children were then assigned to begin their respective programs either immediately or at some time in the future. The exact ages at which comparisons of earlier vs. later are being made depends on the handicapping conditions of the children and the availability of subjects. For example, prior to the initiation of this research, infants who had suffered an intraventricular hemorrhage were provided with medical follow-up but no early intervention services when they were released from the Neonatal Intensive Care Unit at the Medical University of South Carolina. With the initiation of this research, such infants were randomly assigned to one of two groups. Children in the first group received a home-based early intervention program immediately after being released from the NICU; children in the second group began receiving similar early intervention services when they were 18 months old.

Effects of variation in program components. In order to assess how different program components impact on the costs and effects of early intervention with handicapped children, several studies are comparing experimental conditions in which services are provided to handicapped children in systematically different ways. For example, the center-based program in the Des Moines Public Schools has a long history of providing center-based early intervention services for handicapped children. However, the involvement of families in that program was limited to IEP meetings, Parent/Teacher conferences, and fairly routine communication about the program's activities. Working in conjunction with EIRI, Des Moines developed a comprehensive family involvement program which was systematically added to the center-based program. This component included providing families with an effective support network through other families and professionals and assistance in accessing existing social service programs, in addition to training family members to provide structured but brief daily therapy specifically focused on the child's developmental needs.

Children being served by the program were assigned to one of two groups, both of which continued with the center-based program. One group continued the previous minimal family involvement, while the comprehensive family involvement component was added to the other.

Common Elements of Each Study

Even though the studies are being done in geographically diverse sites with varied populations and intervention approaches, each project adheres to the following design features to ensure the integrity of the research and the credibility of conclusions.

Random assignment to groups. As noted previously in this report, many early childhood special educators have questioned the feasibility and/or ethics of randomized experiments. However, properly designed studies are neither infeasible or unethical. Furthermore, even though randomization does not guarantee a "good" study, it is one of the best methods for reducing the probability of many of the most obvious alternative explanations for observed effects.

Impartial data collection. It is well documented in the social sciences that people tend to see what they expect to see (e.g., Foster, Ysseldyke, & Reese, 1975; Rosenthal, 1976). A major problem with past early intervention efficacy research has been the tendency to use data collectors who not only knew which children were receiving the experimental treatment but also had a vested interest in the outcome. In the meta-analysis reported by White and Casto (1985), only 21% of the effect sizes came from studies utilizing "blind" data collectors. The failure to use impartial data collectors is a major design flaw, especially in light of a substantial body of research (e.g., Gould, 1983) which suggests that expectations, even when they are subconscious, can be a powerful influence on how data are collected and interpreted. All of the longitudinal studies conducted by this project are using data collectors who are uninformed or unaware of the purpose of the experiment and the group membership of the subjects. This relatively simple procedure eliminates an important threat to the internal validity of the research studies to be conducted.

Assessing the impact of early intervention on broad measures of child and family functioning. In recent years, there has been a growing awareness that efforts to evaluate the efficacy of early intervention programs have often been too narrowly focused (Ramey et al., 1982; Simeonsson et al., 1982; Zigler & Balla, 1982). As indicated by our previous review of the literature, past early intervention efficacy research has been too focused on easily available, psychometrically sound instruments such as measures of IQ, and has largely ignored other areas of child functioning such as social-emotional growth and adaptive behavior, as well as indicators of family functioning.

Because resources for evaluation are always limited, it is impossible to collect all of the data that might be of interest. However, it is crucial to pay more attention to areas such as social-emotional growth and family functioning. The longitudinal studies conducted as part of this project have selected measures based on two sources of information: (1) what would be predicted by the theoretical/conceptual framework underlying the longitudinal studies and the particular intervention program, and (2) which areas have other investigators identified as important with similar types of interventions.

Information such as IQ, motor functioning, and language functioning is also being collected. However, additional information such as mother and child interaction, parental attitudes toward their handicapped child, child success in school as indicated by special education class placement and grade retention, and perceived stress as reported by the parents is also being collected. In each case, the specific goals and activities of the intervention program is the primary source of information in selecting assessment instruments.

A limited number of instruments are used across all projects. For example, the Battelle Developmental Inventory, the Parenting Stress Index, and the Family Support Scale are used in all projects (see Mott el al., 1986, for a discussion of why these measures were selected). Most of the assessment battery, however, is individually tailored to the particular population being served and the type of intervention program implemented in each of the research sites.

Procedures to verify that the intended treatment was actually implemented. Most reports of the past early intervention efficacy research have failed to explain whether procedures were used to determine the extent to which the intended treatment was actually implemented and how it was experienced by participants. For example, for programs which intended to use parents as intervenors in their child's program, very few report whether parents became involved to the degree intended by the program designer, whether they understood what was expected of them, or whether they carried out the intervention consistently and appropriately. Unless such information is obtained, there is a real danger that comparisons will be made between programs that were intended to be different but that in fact were not. The failure to verify that intended treatments were actually implemented may be partly responsible for the lack of significant findings in those early intervention studies which compared high and low levels of parental involvement (Casto & Lewis, 1984).

To address the problems of interpretation and the resulting ambiguities when there is little or no evidence regarding the fidelity of treatment procedures, each of the longitudinal studies uses both self-evaluation procedures and external monitoring to document the degree to which intended treatments are actually implemented. These procedures are tailored to the individual studies but generally involve site visits by staff members external to that particular project who use checklists, questionnaires, and rating forms to document the delivery of services. Additional information is collected using attendance data, teacher logs, parent questionnaires, and telephone monitoring.

Technical assistance to ensure the provision of high-quality intervention. Early intervention efficacy research is sometimes criticized on the grounds that research studies are often conducted in university laboratory schools with such high levels of funding that the results are unlikely to be replicated in more typical service delivery settings. A second and even more serious criticism could be offered if research were conducted with programs of such poor quality that they might fail to produce the effects which would have occurred if a better intervention program had been implemented.

To prevent these problems, all of the longitudinal studies are conducted in conjunction with ongoing service programs willing to expand or vary the services they are providing in a systematic manner which still reflects the "state-of-the-art" practice in the field. Each site is visited frequently by institute staff to verify the type and quality of intervention being provided, and technical assistance or inservice training is provided where necessary.

Economic evaluation. As noted earlier, a major shortcoming of past early intervention efficacy research has been the failure to consider simultaneously both the effects and costs of intervention. The fact that most studies have ignored costs altogether suggests a tacit assumption that unlimited resources are available for such programs. This is obviously incorrect.

As another example of why both costs and effects need to be considered simultaneously, consider three hypothetical programs which are all designed to reduce the incidence of later special class placement for developmentally delayed preschool children. Program A is the most effective, since 17 of the 20 children are placed in regular programs at first grade, but the cost is $20,000 per participant. Program B is the cheapest at $500 per participant, but only 2 of the 20 children are placed in regular classrooms. In Program C, 14 of 20 children are placed in regular classrooms at a cost of $2,000 per participant. If an administrator wanted to pay as little as possible for the program, B might be seleced. Unfortunately, little benefit would be realized. In a society with unlimited resources for such programs, Program A would probably be the method of choice because it is the most effective. However, in a more realistic situation where resources are limited, Program C would probably be preferred. Although rates of placement in regular classrooms are somewhat lower for Program C, the cost of the program is a fraction of the cost of Program A. Thus, neither the most effective nor the cheapest program is the most cost-effective alternative.

Accounting for the costs of a particular early intervention program is more complex than taking the budget for that program and dividing it by the number of children served. Instead, as is done in each of the longitudinal studies, it is crucial to account for shared and contributed costs, as well as to use standard economic techniques for calculating difficult-to-estimate costs, discounting, judging the robustness of economic assumptions, and figuring benefits. Economic evaluation of social service programs is a relatively new field but one which is becoming increasingly important as people realize that we do not have unlimited resources for providing such services.

Potential Impact of the Longitudinal Studies

The results of the longitudinal studies are expected to contribute substantially to the development, implementation, and improvement of early intervention programs for handicapped children. The most important impact will occur if the studies provide useful information about the most cost-effective structure, content, and age-at-start for early intervention programs. In addition, the data from the economic evaluations will be particularly useful for policy makers.

The results of the longitudinal studies are also expected to influence the way in which future early intervention efficacy research is conducted. For example, it is hoped that the studies will demonstrate the feasibility of combining research with ongoing service delivery. The demonstration of mutually beneficial collaboration between service providers and researchers should do much to encourage similar work in the future.

In a related vein, the studies will also explore the feasibility of implementing rigorous experimental designs in typical service delivery settings. Some scholars have excused the poor quality of early intervention efficacy research by saying that rigorous research is impossible in field-based settings. These studies will demonstrate whether this type of early intervention research is feasible.

An additional contribution will be to address the need for combined cost analyses and outcome evaluations. Very few early intervention programs have successfully combined the two, yet that is precisely the type that decision makers need.

In summary, the results of these studies will provide important information which will be useful to practitioners, researchers, and policy makers in improving the effectiveness of early intervention services provided to handicapped children. Not all questions will be answered by these studies, but significant new information will result, and directions for additional research will be established.

II. RESULTS OF LONGITUDINAL STUDIES

At the present time, 18 separate studies are being conducted as a part of the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children.** The activities and accomplishments during the 1987-88 year, the current status, and the future plans for each study are described in the remainder of this section. To facilitate comparisons between studies, a similar format has been followed wherever possible. It is emphasized that results for each study are preliminary. As new subjects are enrolled, additional data are collected and more analyses are done, the tentative conclusions of this report may change. The purpose of this document is to describe what has been done so far as a means of generating discussion and suggestions which will improve the interpretability of the Longitudinal Studies.

NEW ORLEANS, LOUISIANA IVH/VERY-LOW-BIRTHWEIGHT PROJECT
Project #1

COMPARISON: Grades III and IV Periventricular-Intraventricular Hemorrhage (IVH) or Very-Low-Birthweight Infants -- Treatment vs. No Treatment

LOCAL CONTACT PERSON: Patsy Poche, M.A.

EIRI COORDINATOR: Lee Huntington, Ph.D.

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 10-7-1988

Rationale for Study

Review of Related Research

One of the major determinants of infant mortality is low birthweight (LBW). In the USA, 7.0% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 14,000 low-birthweight infants per year. Racial groups in America demonstrate different low birthweight distributions (Blacks constitute 12.4% of total LBW babies born, American Indians constitute 6.2%).

Forty percent of low birthweight infants (or approximately 5,600 infants) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile, Burstein, Burstein, & Koffler, 1978). Grade I IVH occurs in the subependyma at either the germinal matrix or the choroid plexus. Stage II hemorrhage is a subependymal hemorrhage with extension into the ventricles, but with normal ventricular size. Stage III IVH is a subependymal hemorrhage, with extension to the ventricles, which is accompanied by moderate to severe ventricular dilation. Stage IV, the most severe form of IVH, is a subependymal hemorrhage with ventricular extension, with or without dilation, plus a parenchymal lesion. Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils, may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics:

For each 1,000 LBW infants born--

- **400 suffer PVH-IVH**
- **100 of the 400 (25%) die immediately**
- **85 of the remaining 300 (28%) suffer major neuropsychological impairment**

Information as to the future developmental progress of PVH-IVH survivors is limited and controversial (Hynd, Harloge, & Noonan, 1984). Williamson, Desmond, Wilson, Andrew, and Garcia-Prats (1982) found that 29% of IVH Stage I and II LBW infants exhibited moderate handicapping conditions by the age of 3, whereas Papile, Munsick-Bruno, and Schaefer (1983) found that only 15% of such children could be diagnosed as having these handicaps. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Stage III or IV IVH demonstrated moderate to severe handicapping conditions, such as cerebral palsy, by the third year of life. Finally, Sostek, Smith, Katz, & Grant (1987) demonstrated that the severity of IVH did not predict the infant's developmental progress at 2-years of age, however 40% of the infants in that study showed significant delays at 2-years.

Although there is a fair amount of research on interventions for premature low-birth-weight babies (see Bennett, 1987; Casto, et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey, Bryant, Sparling, & Wasik, 1984; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and virtually all have excluded children who have suffered major neurological insults such as IVH. Two recent studies which have had promising results (Als et al., 1986; Resnick, Eyler, Nilson, Eityman, & Bucciarelli, 1987) have focused on infants with more severe medical problems, but have still focused on in-hospital programs.

Those studies which have examined post-hospitalization home-based interventions have used a variety of intervention programs and had conflicting results. For example, Rice (1977) examined a home-based program of massage and stroking. At the four-month assessment, the experimental group showed greater weight gain, more mature neuronal reflexes, and higher Bayley Mental Development scores. Bromwich and Parmelee (1979) implemented a 14 month home visit program (between the ages of 10 and 24 months) designed to educate the parents with the direct goal of enhancing interactions and the indirect goal of affecting the infants' social-emotional and cognitive and language development. The groups did not differ on any of the cognitive measures at 2 years, but the experimental group scored better on the HOME scale.

Field, Widmayer, Stringer, and Ignatoff (1980) employed a half-hour, biweekly home visitor to teach the mothers about developmental milestones and childrearing, and to demonstrate exercises to facilitate the infants' development. The experimental group had significantly higher Bayley MDI scores at 8 months, and their mothers rated them significantly less difficult. While these studies demonstrate potential for early intervention, the methodological differences between them and the differences in outcomes which thev found, make it impossible to draw compelling conclusions. For example, Rice (1977) and Field et al. (1980) began intervention at discharge, while Bromwich and Parmelee (1979) began intervention at 10 months of age. All three studies excluded infants with major complications. While Rice (1977) and Field et al. (1980) found group differences in cognitive measures at 4 and 8 months respectively, Bromwich and Parmelle did not find any differences in cognitive measures at 2 years after a 14 month intervention. Thus, considerably more research is needed to address such issues as the age at which intervention should start, intensity of intervention, and long term effects of intervention.

Overview of Study

A major issue in the study of early intervention in general is the effect of the intensity of treatment which the infants receive. The issue of intensity needs to be examined with particular care in infants who are "at-risk" for developmental problems because of severe medical complications. Because the nature of "risk" is probabilistic, it is a given that many of the infants will improve and show little or no deficits without any intervention. If 60% (according to recent estimates) of the infants who suffer IVH show only subtle problems later, then the effects of the intervention must be large enough to be detected despite the improvement found following the natural course of the complication. Thus, examination of intensity requires that the groups be sufficiently large and the treatments sufficiently different to maximize the possibility of detecting the effects of the intervention.

Since infants in the geographic area of this study currently receive only medical follow-up, an intervention program was designed and is provided to half the study infants on a random assignment basis. Briefly, this intervention program consists of 1) in hospital recruitment and transition into the intervention program. 2) weekly home visits by members of a transdisciplinary team, and 3) an optional parent group meeting once a month. Children assigned to the non-intervention group continue to receive the standard level of treatment in the community.

Methods

This study was conducted in cooperation with the Community Action for Parental Success (CAPS) program at Louisiana State University Medical Center. CAPS provides services through a collection of community-based agencies for minority, low income, and handicapped infants. Services are offered in three phases: (1) In the hospital, while the infant is in the neonatal intensive care unit; (2) at home, once the child is released from the hospital; and (3) at a center for parent/child intervention, when the infant is older and medically stable. The current program differs from previous services in that intervention begins at birth and is provided in a multidisciplinary framework, infants are seen weekly, and referral to other services is immediate, with help accessing those services provided by the intervention team.

Full-time direct service staff for CAPS is composed of an MSW/Program Coordinator, Occupational Therapist, and Speech Pathologist/Infant Specialist. Part-time direct service staff include a nurse, nurse practitioner, paraprofessional home-visitor, and a social worker.

Subjects

As of September 1, 1987, there are currently 29 children between 3 and 15 months of age (corrected to control for prematurity) enrolled in the study. Of these, 3 have been posttested. Subjects were either diagnosed by ultrasound as having experienced periventricular-intraventricular hemorrhage or were born with a birthweight lower than 1000 g. Subject recruitment will continue through October 1988, at which time it is expected that 40 subjects will be enrolled. The current sample is composed of 87% Black and 13% White infants from both urban and rural areas.

Recruitment. Infants qualified for participation in the research if they had been a patient in NICUs at Charity Hospital or Tulane Medical Center and if they had experienced perinatal intraventricular hemorrhage (IVH) of Grades III or IV severity or had a birthweight of less than 1000 g, and if they resided in the catchment area for treatment. Subjects who met the inclusion criteria were identified while in the NICU. Parents of eligible infants were contacted in the while their infant was still in the NICU and then telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions depending upon where random assignment placed them.

Assignment to Groups. All assignment to groups was performed by the site coordinator at the Early Intervention Research Institute (EIRI). For the purposes of this study, it was necessary to ensure that the distribution of both grades of IVH and birthweights be comparable between the treatment and control groups. The treatment and control conditions were thus stratified by severity of IVH (Grades III or IV) and birthweight (under 1000 g or over 1000 g) yielding a 2 (Grade; III or IV) x 2 (Birthweight; under 1000 g or over 1000 g) design. Imposing this stratification scheme on the treatment and control group yielde[illegible] x 2 x 2 design. Before any infants were assigned, a random number generator indicated the order of assignment to treatment or control for each sequence of four children fitting a stratification cell. The four cells thus differed on the order in which children with those characteristics were assigned to the treatment or control group. After four infants with particular stratification characteristics were assigned, the random number generator was used to designate another assignment order for the next four infants in that cell. Parents were informed of their infant's assignment after they gave approval to participate in the study.

Demographic Characteristics. Demographic information on the subjects and their families was gathered from a questionnaire and from medical discharge summaries. All of the children were from families who reside in the metropolitan area of New Orleans, Louisiana. The demographic characteristics of the sample, divided by groups is represented in Table 1.1. A larger proportion of single parent than two parent families were represented in the study. The enrolled families were predominantly low income and included some single adolescent mothers. The intervention and control groups did not differ significantly on any of the pretest demographic measures.

Currently, 5 subjects who were enrolled have dropped out of the study. Four subjects moved and the other refused treatment. All five were lost after enrollment, but before evaluation, thus, there is no data on demographic characteristics for these children. Additionally, two subjects have died. One died after enrollment, but before testing, and the other died after pretesting, but before posttesting. This subject's pretest data was not included in the current analyses.

Intervention Programs

The comparison for this study is between a group of infants who receive the medical follow-up program offered by the hospital and a group of infants who receive an organized early intervention program conducted by the Human Development Center.

Table 1.1

Comparability of Groups on Demographic Characteristics for LSU/IVH Treatment-No Treatment Study

	Enrolled and Active by June 1, 1988						
	No Intervention			Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/88	13	(6)	9	14	(4)	10	.46
• Age of mother in years	27	(9)	9	24	(6)	9	.37
• Age of father in years	28	(6)	6	25	(5)	6	.34
• Percent Male*	56		9	50		10	.82
• Years of Education for Mother	11	(2)	9	11	(2)	10	.79
• Years of Education for Father	12	(2)	7	12	(.89)	5	.48
• Percent with both parents living at home	44		9	20		10	.28
• Percent of children who are caucasian*	11		9	10		10	.94
• Hours per week mother employed	9	(17)	8	0	(.33)	9	.17
• Hours per week father employed	42	(3.5)	2	40	(0.0)	5	--
• Percent of mothers employed as technical managerial or above*	0		8	0		10	1.00
• Percent of fathers employed as technical managerial or above*	0		2	0		4	1.00
• Total household income$^{\Delta}$	2,376	(2,012)	8	4,112	(3,907)	9	.27
• Percent receiving Public Assistance	78		9	70		10	.71
• Percent with mother as primary caregiver*	89		9	100		10	.95
• Percent of children in day care more than 5 hours per week*	12		8	0		10	.44
• Number of siblings	1	(2)	9	1	(1)	10	.56
• Percent with English as primary language	100		7	100		9	1.00

Notes: *Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the characteristic were scored "0."

$^{\Delta}$ Means and standard deviations for this variable were estimated from categorical data.

Medical Follow-Up

The follow-up program examined each infant at 3 month intervals and made referrals to a variety of specialty clinics, but little organized effort was made to ensure that parents followed-through on the referrals. This was the standard level of intervention program for medically fragile infants in this area. When more of the infants in the nonintervention group are posttested, we will have information about the other services that they accessed during the year.

Expanded Intervention Program

The intervention package for this research project consisted of select educational procedures which have been used routinely in a number of settings. The intervention package consisted of three phases. These three phases were: hospital-based, home-based, and center-based.

Hospital-based phase. The hospital-based phase took place at Charity Hospital and Tulane Medical Center Hospital. The purpose of this phase was to provide families of the experimental group with early contact with members of the intervention staff, to reinforce teaching conducted by hospital staff, and to provide information on accessing appropriate community services such as Handicapped Children's Services. The Brazelton Neonatal Behavioral Assessment Scale (NBAS) was used to develop an individualized description of the infant to be used for parent training. For example, if an infant showed low autonomic stability on the NBAS, the interventionist would plan ways to work with the mother on soothing and not overstimulating the infant. The NBAS was administered by the Project Nurse who was certified by staff from Boston Children's Hospital in the administration of the NBAS.

Home-based phase. The second phase of the project began after NICU discharge, and consisted of home-based early intervention conducted cooperatively with an existing social service agency home-based parent training program for low-income mothers. The purpose of this phase of the program was to provide the infant's family with follow-up training on the proper care and handling of the infant. The infant was assessed, and an Individual Family Service Plan (IFSP) was developed in cooperation with the parents. Treatment objectives were determined in the areas of the infant's and family's greatest needs, but typically included objectives from the motor, self-help, receptive language, and social-emotional areas. The treatment program was delivered by the parents.

Individual family and child activities were designed to be integrated into the normal daily activities of the families. The four curriculum domains were compatible with routine daily activities such as feeding, dressing, and playing. Traditional developmental domains such as communication, cognitive, and gross and fine motor, and therapy techniques such as positioning and handling, were integrated into these routine activities throughout each of the three phases.

The primary intervenors, in addition to the parents, were a paraprofessional home visitor and the case manager. The transdisciplinary team provides regular input on family and child progress, and consultation in their areas of specialty when needed. Each family was scheduled for a weekly one or two hour home visit. Simple, practical programs were left with the principal caregivers each week, and performance was monitored weekly through an observation checklist.

Center-based phase. The third phase of the intervention consisted of an optional center-based early intervention program conducted with the Urban League Parent/Child Center program. This program consisted of twice monthly parent group meetings conducted by a social worker and devoted to topics such as nutrition and childrearing.

Each of the intervention phases was driven by an Individualized Family Service Plan which was developed by the transdisciplinary team. One of the full-time staff was designated case manager. The case manager could, therefore, have been an occupational therapist, speech pathologist, infant specialist, or social worker. Representatives from each of the collaborating agencies were involved in the development of initial and follow-up IFSP goals, objectives, and activities. The case manager was responsible for assuring that direct service as well as referral objectives were met.

Treatment verification. A number of procedures were developed to verify that treatment was being implemented as intended. For example, the intervention team records all home visits, clinic/agency visits, and telephone contacts using a cumulative Monthly Contact Summary Sheet. Cancellations and hospitalizations were also noted. The data for the past year indicate that the infants in the intervention have received an average of 4.4 hours per month of combined home and center visits and have cancelled an average of one visit per month.

As a measure of the time that parents spent implementing the intervention, the interventionist elicited from parents an estimate of the amount of time per week that was spent with the child in activities that were recommended by the therapist. Parents reported an average of 8 hours per week, ranging from 1.25 to 15.2 hours. In addition, the interventionist rated their impression of the accuracy of the parent's report on a three point scale, with 1 being not accurate to 3 being very accurate. analysis of these data indicate that the interventionists ratings of the parents averaged 1.7, indicating that the interventionists considered the parents slightly inaccurate in their reports.

A formal site review was conducted semi-annually. A site review visit was conducted in October, 1987. The purpose of this review was to collect information about the nature and quality of early intervention services being delivered. The site review was conducted according to the treatment verification process described in the Treatment Verification Handbook for Research Sites (EIRI, 1987), according to the procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Appendix A of the handbook. This research site rated very highly on all criteria of the site review.

Cost of the early intervention. The cost per child for the LSU/IVH site was calculated using the ingredients approach described earlier and are presented in Table 1.2. The costs are presented for the intervention only; the hospital involved in the study does not keep records of the cost per child, therefore, the medical costs for the infants were not available. Hospital costs have been calculated for the infants from the Salt Lake City and South Carolina IVH study sites. It is likely that the costs for the LSU subjects would be similar.

Calculation of the cost per child for this intervention was based on the cost to the program of the following resources:

Personnel Resources: Salary plus benefits were calculated for all direct service personnel (2 case managers, 1 nurse, 1 social worker) and administrative staff (1 director, 1 coordinator, 1 research associate, 1 secretary) based on the proportion of their FTE devoted to the service portion of this project.

- Social services, a home interventionist, medical and other consultation services were purchased on a contractual basis throughout the year. Consultation costs were based on the proportion of the time that applied to the direct service.

- Parent time was required during the home visits and cost for this time was calculated according to the method discussed previously. The cost per child for this time was based on a average of 54.63 hours per parent year.

Facilities: Calculated by applying the indirect rate of 18% to the total direct service and administrative staff costs.

Equipment: Included instructional and adaptive teaching material. All office equipment costs were included in the indirect rate for facilities.

Staff Transportation: For 3 case managers to make home visits. Compensated at $.21 per mile.

Materials and Supplies: Annual cost of all consumables for the program.

Table 1.2

Cost Per Child for LSU/IVH (1987-1988)

Resources	Cost Per Child (N=13)
Personnel:	
Direct Service	$ 6,183.39
Administrative	3,052.23
University Indirect Costs[1]	1,277.83
Equipment	50.73
Transportation	108.92
Materials	115.38
Miscellaneous	15.38
Subtotal	$10,803.86
Contributed Resources:	
Volunteers	
Parents	573.66
TOTAL	**$11,377.52**

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[1] University indirect rate is 18%. Includes facilities, equipment, capital improvements, and some administration.

This cost per child makes this program extremely expensive. The major factor that mitigates the expense is the fact that this program was nonexistent in the area previous to the implementation of this research project. Thus the cost was based upon a larger portion of the director's and coordinator's time than would be expected in a program which was established prior to the beginning of the project. Also, the per child cost was based on a smaller number of children served than will be the case in future years.

Another factor that increases the cost for the program was the amount of time necessary to enroll children in the program. Unlike a program which receives referrals from hospital follow-up programs, this project established contact with the parents in the hospital. In order to be available when the parents were visiting and acquire consent for participation, a nurse was required to spend 10 hrs. per week at the hospital. If these costs were adjusted for the amounts of time that is projected for next year, the per child cost would be $9,290 based on serving 13 children, and $6,039 based on serving 20 children next year. While still expensive, it is clear that in the second year of the service project, the costs will be far more reasonable.

Data Collection

Data was collected for this project to determine the effect of early intervention upon the child and the family. The assessment instruments were chosen to provide consistency of data collection between sites. However, some assessment instruments were chosen for this project to assess child and family variables unique to early intervention with infants suffering Grade III and IV IVH.

Recruitment, training, and monitoring of diagnosticians. Four local diagnosticians were trained to administer the pre- and posttest measures. The diagnosticians have master's degrees. Testing was scheduled directly with the diagnostician by the site coordinator. Shadow scoring of 10% of test administrations was conducted by another trained diagnostician. Interrater reliability data reveal an average coefficient of .88.

Pretesting. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants were tested with the BDI, the Movement Assessment of Infants (MAI) and a neurological assessment. The parents complete the Parenting Stress Index (PSI), the Family Support Scale (FSS), the Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III). The BDI was administered by a trained diagnostician who was unaware of the infant's group assignment. Test and questionnaire protocols were sent to the site coordinator for scoring and placement in a data file. A duplicate set of the data was sent to EIRI. Parents were paid $45 for their time in completing the evaluation session. The pretest assessment battery provides information about the child's early developmental status and neurological functioning. In addition, family measures provide information on family reaction to the newborn, parent stress, and family support systems.

Posttesting. Posttesting occurs at 12 months corrected age and annually thereafter. The posttest battery was administered by a diagnostician who was "blind" to the subject's group assignment. The child was given the BDI and a follow-up neurological examination and the parent again completed the PSI, FILE, FACES III, FSS, FRS. Parent also completed a survey of additional services received by the child in the last year, a report of child health during the last year, and a parent socioeconomic survey. Parents were paid $45 for completion of the evaluation. Additional measures taken at 12 months corrected age were videotapes of mother-infant interaction and one of motor development completed by a trained child development specialist or licensed physical therapist. Parents were paid $10 as an incentive.

The videotape of motor functioning followed a specific script. The motor script had the child perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape recorded the parent and child in play activities. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent was instructed to encourage the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds, and taping continued for two minutes after the parent returns to the room.

Finally, parents completed the Carey Infant Temperament Scale, which assessed the parents' perceptions of their infant's temperament at 6-9 months of age. Scoring categorizes infant's temperament as easy, intermediate, slow-to-warm, and difficult. Parents' rating of the child's temperament was compared with information obtained in ratings of parent/child interaction videotapes taken during posttesting.

The posttest data provides information regarding the effect of early intervention upon the infant's development and the impact upon the family. Changes in family stress, resources, and socioeconomic status over time will also be assessed. The rating of mother-infant interaction will be compared with other outcome and family measures and the relationship of infant temperament to quality of parent-infant interaction will be assessed.

Results and Discussion

The purpose of this study is to examine the effects of a family and child directed early intervention program. At this time only two of the subjects have reached the age of first posttesting, thus the current data analyses examine the initial comparability of the groups. By September of 1989, it is expected that 10-15 subjects in each of the groups will have been posttested.

Initial Comparability of Groups

Table 1.3 represents the comparison of the pretest measures for the intervention and control groups on the child functioning and family measures. There were no consistent trends or statistically significant differences between the groups on these variables. Taken together with the lack of between groups differences on the demographic characteristics, these results support the conception that the random assignment of infants to groups results in groups that were comparable at the onset of the intervention process.

Conclusions

This project is in a position to provide useful data on the efficacy of an intensive intervention program for prevention or amelioration of developmental delays in infants at risk because of a history of complications of preterm birth. The program fills void in the geographical area in which it is being implemented, and by comparison with the standard of service in the area will provide a strong contrast in intensity of intervention. This factor, coupled with the balance of the groups provided by the random assignment protocol will provide a powerful basis for drawing conclusion about the efficacy of programs of this type.

Table 1.3

LSU/IVH Treatment-No Treatment Study
Comparability of Groups on Pretest Measures

	All Subjects Posttested by June 1, 1988								
	No Intervention				Intervention				
Variable	$\bar{X}$	(SD)	%ile[+]	n	$\bar{X}$	(SD)	%ile[+]	n	P Value
•Age in months at Pretest									
•Battelle Developmental Inventory (BDI)[*] DQs for:									
Personal Social	102	(51)		9	93	(40)		10	.66
Adaptive Behavior	102	(70)		9	107	(36)		10	.83
Motor	80	(34)		9	91	(21)		10	.41
Communication	70	(41)		9	74	(55)		10	.87
Cognitive	49	(37)		9	60	(33)		10	.51
TOTAL	78	(36)		9	90	(33)		10	.45
•Parenting Stress Index (PSI)									
Child Related	111	(20)	70	9	113	(10)	79	10	.78
Other Related	107	(29)	25	9	120	(14)	48	10	.24
TOTAL	229	(37)	61	9	234	(20)	66	10	.76
•Family Adaptation and Cohesion Evaluation Scales (FACES)[°°]									
Adaptation	2.1	(1.3)		9	2.3	(1.2)		10	.71
Cohesion	1.7	(.9)		9	2.3	(1.2)		10	.30
TOTAL	2.2	(.8)		9	2.1	(.6)		10	.75
•Family Resource Scale (FRS)[Δ]	119	(15)	51	9	110	(14)	35	10	.20
•Family Support Scale (FSS)[Δ]	23	(14)	36	9	22	(10)	33	10	.84
•Family Index of Events (FILE)	5.7	(4.7)	60	9	7.7	(8.2)	50	10	.54

NOTES: [*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this Table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[°°] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the Table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[Δ] Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores and positive ESs are considered better

[+] Percentile scores for the PSI and the FILE were based on national norming samples. The FRS and FSS have not been normed nationally. Percentile scores for these measures were based on the EIRI Longitudinal Studies' data base.

LOUISIANA STATE UNIVERSITY MEDICAL CENTER
HUMAN DEVELOPMENT CENTER (LSU/VI)
Project #2

COMPARISON: Visually Impaired Children -- Weekly parent-infant sessions versus twice-monthly parent group meetings.

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LOCATION: New Orleans, Louisiana

DATE OF REPORT: 10-7-1988

Rationale for Study

The importance of vision in early development is crucial, as demonstrated by experts such as Fraiberg (1977), Barraga (1986), Warren (1977), and Ferrell (1986). By age three, infants with visual impairments often demonstrate socio-communicative and cognitive delays that are quantitatively and qualitatively different from their sighted peers (Ferrell, 1986; Warren, 1984). Ferrell (1986) stated that all of these secondary handicaps are preventable; they occur because there has not been sufficient, systematic intervention given to the child and his/her family.

Visual impairment also causes a disruption in the interaction between the caregiver and child. Als (1983) observed that the infant with visual impairments signals and communicates differently. These signals are often distorted and difficult to interpret, making positive, constructive interaction even more difficult for parents who often are attempting to cope with the emotions of having an infant with a handicap. Rowland (1984) summarized the findings of researchers involved with visually impaired children by stating "the importance of appropriate exchanges between mothers and infants cannot be overstressed." This highlights the importance of involving parents in the intervention process.

Though researchers speculate that intensive intervention for both child and family is necessary, there is a dearth of evidence regarding the intensity with which this intervention should be provided. Little data is found to assist in answering the question of how to provide the best intervention (White, Bush, & Casto, 1986). Though the importance of early intervention for children with visual impairments and their families has been noted frequently in literature, few controlled prospective studies have been completed on children with visual impairments, especially at the infant and toddler levels (Warren, 1984). This study of early intervention for visually impaired infants and toddlers compares the long-term effects of a comprehensive, homebased intervention one time per week parent-child sessions with a much lower intensity treatment of twice per month parent group meetings.

Halpern (1984) reports that over the past decade there has been a rapid growth in home-based programs serving handicapped or at-risk preschoolers. Philosophically, there are numerous advantages to a home-based intervention and the involvement of the family. Shearer and Shearer (1976) provide the rationale:

> (1) Learning occurs in the parent and child's natural environment.... (2) There is direct and constant access to behavior as it occurs naturally.... (3) It is more likely that learned behavior will generalize and be maintained....(4) There is more opportunity for full family participation in the teaching process....(5) There is access to the full range of behaviors.... (6) Training of parents, who already are natural reinforcing agents, will provide them with the skills necessary to deal with the new behaviors when they occur....and (7) Because the home teacher is working on a one-to-one basis with the parents and child, individualization of instructional goals for both is an operational reality. (pp. 336-3337)

There are also advantages to home based intervention that are more practical in nature. For rural or low-income families, travel to a center location is often difficult. Additionally, some children have medical needs that make leaving the home difficult (Bailey & Simeonsson, 1988). In spite of these theoretical and practical justifications for home-based intervention, little is known about the effectiveness of this mode of service. This study will serve the field by providing information regarding a frequently-used method of intervention.

Since 1969, seven studies having quasi-experimental designs and appropriate outcome data have been conducted with visually impaired children in an attempt to provide some degree of objective information on the effectiveness of early intervention (Adelson, & Fraiberg, 1974; Allegheny County Schools, 1969; Bregani et al, 1981; Fraiberg, 1977; O'Brien, 1976; Olson, 1983; Rogow, 1982). Unfortunately, these studies were lacking an appropriate comparison group; the visually impaired subjects were typically compared to normally sighted peers or a blind comparison group from a previous study. This study provides an opportunity to improve upon these research designs, utilizing random assignment of a sample of visually impaired children to one of two treatment conditions. This study will also clarify the conclusions as to what effects are due to the treatment as opposed to other related variables.

Longitudinal data are needed to determine whether effective early intervention programs continue to have a noticeable effect on children as they get older (Warren, 1984). Though five of the seven studies had interventions that were at least one year in duration, some of them provided information regarding long-term effects of the treatment. Since this study will include outcome data for several years following the treatment, it will provide some needed information concerning long-term treatment results.

Exemplary services designed for children with visual impairments have generally been described as needing to be comprehensive in nature, providing systematic instruction to the child as well as providing parents with instructional strategies and support. Unfortunately, most previous studies have not provided clear descriptions of their interventions. For example, specific regard to training techniques, curricula, and shaping procedures would help in understanding the treatment as well as increase the ability of others to replicate the techniques (Guralnick & Bennett, 1987). This controlled study comparing a well-designed treatment serving both parent and child with a control condition of lower intensity directly serving only the parent will add greatly to the knowledge needed to respond to the aforementioned questions. The collection of treatment verification data will provide specific information facilitating replication of any effective treatments.

Using a systems theory perspective, this study offers an opportunity to help answer the question of how the program, family, and infant systems interact. In particular, to have an impact on the infant system, is it necessary to interact directly with the infant or is it possible, or even preferable to have contact through the parent who is the most salient outside system in the infant's environment? Because the parents and infant already exist as a family system, it may well be that intervention should be as subtle and unintrusive as possible, in order not to disrupt this developing system. On the other hand, more intensive, direct, and concrete intervention provided to the parent and infant may be more effective simply because of its direct nature. Furthermore, the family system may already be disrupted due to the infant's handicap and this added support may not be a burden to the family system but a support instead.

Finally, this study will provide an economic perspective on early intervention. The intensive program is much more expensive, but it is consistent with "best practices" and will thus provide a good investigation of cost-benefit ratios relative to the low-intensity control group. Cost-benefit information can be separated to analyze the cost-benefit ratios for effects in child growth as well as impacts on the family. For instance, the low-intensity twice-monthly parent group may be found to create greater positive benefits on family functioning when compared to the high-intensity individualized treatment group.

Methods

This study is being conducted in collaboration with the Human Development Center (HDC, a University Affiliated Program) at Louisiana State University in New Orleans. Funding for the HDC is provided in part from the Department of Education, Office of Special Education and state and local sources. The LSU/VI services are funded by the

Louisiana Office of Education and was originally developed by Dr. Judith Holt, who is a certified teacher of the visually impaired with extensive experience in service provision and research. Staff include a home visitor and consulting service providers who are therapists at the HDC. The program was developed specifically for the research project and provides services to visually impaired children and their families who would otherwise receive no services designed for visually impaired children.

The geographical area served includes the area within a 60 mile radius of New Orleans. Current services for visually impaired children 0-3 years are limited to programs designed to serve developmentally delayed children or those that provide private motor and/or speech/language therapy. There is no other program in the area that provides programming specifically to meet the needs of children who are visually impaired.

The assistance in the identification of potential research subjects as well as providing sophisticated information regarding various aspects of the subject's vision (i.e., acuity, perception, and discrimination) is provided by the LSU Eye Center. The center is one of the top three centers for pediatric ophthalmology in the country.

Subjects

A total of 35 children between the ages of 0 to 30 months have been identified and randomly assigned to groups as of July 1, 1988. The following section describes the recruitment and random assignment procedures for the study. Demographic statistics revealing comparability between groups follows.

Recruitment. Subjects are being identified through referrals from the LSU Eye Center and from pediatricians and ophthalmologists in the New Orleans area. Children who are identified as potential subjects are screened by either the site coordinator or the teacher and social worker hired for the study. Each child is classified according to visual acuity, presence of other handicapping conditions, and developmental level as follows.

Visual acuity: 1 = blind
2 = severely impaired with correction
3 = mildly or moderately impaired

Handicapping condition: 1 = no other handicapping condition
2 = presence of one or two mild handicaps
3 = more than two mild or severe handicaps

Developmental level: 1 = no more than a 33% delay in motor or socio-communication/cognitive areas
2 = more than 33% delay in either motor or socio-communication/cognitive areas
3 = more than 33% delay in both motor and socio-communication/cognitive areas

The presence of a handicapping condition is determined by the clinical judgement of qualified motor therapists and/or communication disorders specialists. Developmental level is obtained through the use of a screening instrument that consists of selected items from the Early Intervention Developmental Profile.

Initially, it was decided that all children with visual impairment, regardless of the severity of other handicapping conditions, were to be included in the study. Later, it was decided to include only children who were primarily visually handicapped. Children are now eligible for inclusion in the study if the vision impairment is the major disability and the delays are due primarily to their vision impairment. Children who have more than two other handicapping conditions and who have more than a 33% delay in both motor and socio-communication/cognitive areas are not eligible for enrollment in the study. The original subject pool (prior to March 20,1987) only contained one subject who was disqualified using these new criteria. This child has since been dropped from the study, though he continued to receive services.

Generally, subjects that are recruited are not involved in other programs for children with disabilities. It is possible for subjects who have received prior services to be enrolled in the study. However, given that random assignment procedures are used, any subjects who have received services in the past should be balanced across both groups. It is possible that children who have received prior services may continue to be enrolled in some circumstances if they moved to the New Orleans area from another geographical region where services were provided. Again, random assignment should ensure that these subjects are balanced across both groups.

Assignment to groups. After receiving a signed informed consent form from parents, children are randomly assigned to groups stratified by visual acuity, and a combined score for handicapping condition and developmental level. (Refer to the EIEI 1986-1987 report for a more detailed description of the assignment procedures).

On February 13, 1987, those children who were identified during screenings in the first two weeks of February were rank-ordered by age within the cells. The random assignment pattern was determined for each cell by a computer-simulated four-sided die. Children were assigned based on this pattern within cells. Children who were identified after that date were placed in the appropriate cell and assigned according to the assignment pattern.

Demographic characteristics. Subjects have been enrolled at an average of 1-2 subjects per month. It is estimated that fifty children 36 months of age or younger will be randomly assigned to treatment groups by June, 1989. Since this study involves continuous enrollment, posttest data are also collected continuously throughout the year. As of July 1, 1988, 17 subjects had been posttested following 12 months of participation in the study.

Demographic pretest data on the 32 subjects enrolled as of July 1, 1988, is reported in Table 2.1. Also the demographic data for those 17 children for whom post test data are available as of July 1 are also provided. The population from which children are being drawn is about 18% black and has a high degree of variability with respect to socioeconomic status. Notable differences can be found between groups on percent receiving public assistance, with more subjects in the experimental group

Table 2.1

Comparability of Groups on Demographic Characteristics for LSU/VI Study

Variable	Active Subjects Enrolled by June 1, 1988							Subjects Included in Posttest Analyses						
	Low Intensity			High Intensity			P Value	Low Intensity			High Intensity			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age of child in months as of 7/1/88														
• Age of mother in years	26.8	(4.5)	15	28.4	(6.8)	15	.47	33.8	(.9)	9	35.8	(1.2)	8	.76
• Age of father in years	32.3	(8.4)	13	34.4	(10.6)	14	.57	28.2	(4.1)	9	31.9	(7.1)	8	.21
• Percent male *	40%	(.5)	15	60%		15	.29	35.8	(8.0)	8	39.1	(11.7)	8	.52
• Years of education for mother	13.1	(1.9)	15	12.9	(2.6)	15	.75	22%		9	50%		8	.26
• Years of education for father	13.4	(3.1)	12	13.1	(3.3)	14	.79	13.6	(1.7)	9	13.0	(3.0)	8	.64
• Percent with both parents living at home*	79%		14	86%		14	.64	14.3	(3.4)	7	13.9	(3.6)	8	.83
• Percent of children who are caucasian *	80%	(.41)	15	73%		15	.68	78%		9	88%		8	.63
• Hours per week mother employed	19.1	(19.0)	15	9.3	(17.1)	15	.15	78%		9	75%		8	.90
• Hours per week father employed	40.9	(16.6)	9	39.5	(21.8)	13	.87	18.9	(13.3)	9	7.0	(14.5)	8	.16
• Percent of mothers employed as technical managerial or above*	40%		15	13%		15	.11	44%		9	25%		8	.43
• Percent of fathers employed as technical managerial or above*	46%		11	58%		12	.56	50%		6	57%	(.5)	7	.82
• Total household income	$28,000	(16,650)	14	$26,066	(26,961)	15	.83	$28,000	(17,762)	9	$37,375	(32,225)	8	.46
• Percent receiving public assistance	20%		15	40%		15	.25	11%		9	38%		8	.23
• Percent with mother as primary caregiver *	80%		15	87%		15	.64	78%		9	88%		8	63
• Percent of children in day care more than 5 hours per week*	53%		15	27%		15	.15	56%		9	25%		8	23
• Number of siblings	.6	(.8)	15	.8	(.86)	15	.52	.67	(1.0)	9	1.1	(1.0)	8	36
• Percent with English as primary language	100%		15	100%		15	----	100%		9	100%		8	00

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "0."

receiving assistance. Differences between groups on hours per week the mother is employed approaches significance. Differences in household income become notable when comparing subjects included in the posttest analysis. This appears to be due to the small number of subjects, with a few high-income families screwing the mean. It is anticipated that these difference in demographic variables will disappear or at least diminish in significance as more subjects are enrolled.

Subject Attrition. As of July 1, 1988, five subjects have dropped. Three were disqualified due to the severity of other handicapping conditions, identified shortly after enrollment, and therefore, they no longer met the criteria for study. These children continued to receive services although they were no longer considered active subjects for this study. One subject's vision dramatically improved on follow-up, which disqualified her from study participation. One subject was dropped from the study based on the parent's decision to no longer receive intervention. There are, thus, 30 active subjects at the present time.

Intervention Programs

The alternative interventions consist of weekly individualized home-based intervention, or a twice-monthly parent group meetings. A detailed description of the treatments follows.

Weekly individualized treatment. Treatment for 0- through 36-month-old subjects consists of parent-infant training sessions in which parents or primary caregivers are given a structured program individualized to meet the needs of the family as well as the child.

All infants/toddlers in the individualized treatment group are scheduled for 1 hour of intervention services weekly. Generally, intervention services are provided in the child's home. Daily routines, such as feeding, diapering and changing, and familiar toys and household items are incorporated into the activities. In two instances, it has been necessary for the parent to bring the child to the program center for intervention services. The travel expenses for both families are covered through program funds. One child is attending a regular day care center, 5 days a week, and the program teacher provides services there. Meetings are held between program staff, day care staff, and the parent to discuss and plan strategies and exchange feedback. All parties are pleased with this pattern of service delivery which is, in fact, the most natural setting for this child.

Role/needs of the family. Every effort is made to involve the parents/family in activities designed for the child. The caregiver actually involved in the sessions varies according to the lifestyle of the family. With some families, the role of caregiver varies among parents, grandparents, babysitter, and preschool teacher. In any event, the person with primary caregiving responsibility for the child at the time is an active participant in the session.

In instances in which a parent is not the primary caregiver during program intervention sessions, every effort is made to share information with them in telephone contacts and other visits. The degree of caregiver involvement in any one session is individualized according to the needs and skills of the caregiver. The role of the intervenor may be assumed almost entirely by the caregiver, with the program teacher guiding and giving feedback. In other instances, the program teacher may demonstrate while the caregiver observes. In most sessions, there is a combination of these patterns. New activities are generally first introduced by the program teacher, who then instructs the caregiver in implementing the activity. Parents are involved in collecting data and charting behavior in the home between sessions.

In addition to focusing on specific need of the individual infant/toddlers, the needs of the family in relation to the child are addressed. Treatment reflects the family's needs in regard to interacting with the child, developing their general knowledge of visual impairments, and improving their skills in encouraging their child's development. Needs for assistance or guidance in obtaining community services such as medical or day care services for their child are also addressed.

Curriculum. The Louisiana Curriculum for Infants with Handicaps, which was developed by the Staff of the Human Development Center, forms the basis for development of intervention activities for this program. The activities in the curriculum take into account the total child and the interactive nature of development across domains.

Individual activities (lessons) have been developed for the domains of gross motor, fine motor, cognition, self-help, social-emotional, and communication. Information with each lesson includes: area, goal, rationale, materials, cautions, teaching procedures, teaching notes, and evaluation criteria. A data collection sheet is available for use by parents and program staff.

A Curriculum Placement Instrument (CPI) for each domain was developed in conjunction with curriculum and serves as means for choosing activities appropriate for the status of child and family. Modifications are made in specific activities in the curriculum, in consultation with the professional staff, in order to adapt them to an individual child's needs and as appropriate for the child's vision.

In addition to the observation and modeling provided by the program teacher, parents are provided instructions on how to implement a specific lesson and the type of weekly data to be collected. Often parents request information on a particular topic related to visual impairment or child development. The home intervenor provides supplemental information from the Reach Out and Teach curriculum (Ferrell, 1986). This is a manual designed to provide parents with information about visual impairments and appropriate general stimulation activities.

Staff Roles. The program teacher is the primary service provider working closely with the parents or other caregivers. The program teacher plans sessions and activities, guides interventions, collects data, maintains attendance records and individual child workbooks, and coordinates consultations and direct services from other professionals. Two certified teachers experienced in serving young children with special needs are currently serving as the intervenors for the high intensity group.

The speech therapist, occupational therapist, physical therapist and social worker at the Human Development Center are available to assist in meeting needs of the infants/toddlers and their families enrolled in this program. All children are seen, initially, by at least one of these specialists in the screening process. Depending upon the impairments of the child and needs of the family, the specialists are called upon for consultation with the program teacher and/or parents, or for provision of direct services. For example, the speech therapist assists the program teacher to design a feeding program; and the OT and PT consult and provide direct services for several children with gross and fine motor problems; and the social worker assists the program teacher in helping a family with interpersonal problems to obtain social services.

Twice-Monthly Parent Group. Families in the low intensity control group are offered services in the form of group meetings which are held every other week for approximately one hour. The meetings are planned and implemented by a professional with a master's degree in social work. Although informal, they always have a specific topic for discussion, with readings assigned and time for questions and answers. After an introductory meeting, appropriate professionals attend the meetings to discuss cognitive development, social skills and temperament. Presentations have focused on the effects of visual impairment on these various areas of development with general suggestions for compensation. General stimulation activities are suggested, but no individualized treatment plans or activities are provided. Slides and tapes developed for use with Reach out and Teach have also been used.

After each presentation by a professional, parents have time to ask child specific questions and discuss issues of concern to them. Discussion has been generated by the Reach Out and Teach books. For example, the differences among the visual impairments of the children whose parents attend the group meetings may be a topic of discussion. These sessions also function as a support group, whereby parents with older children who are visually impaired may offer support and information to the parents of younger children.

Additional Services. Given this treatment intensity design, it is important to document any additional services that subjects may be receiving. There are no other services available in the study's geographical area designed to specifically treat children who are visually impaired. However, there are other services available for children with developmental delays. Parents can hire motor and/or communicative disorders specialists, though this is expensive. The Children's Hospital can also provide such therapies to families who receive public assistance. There are also other infant programs, though these do not specialize in serving visually impaired children. The center-based program at the Human Development Center is an exemplary program that serves children with severe handicaps. However, due to their emphasis on research and personnel preparation, the program serves only 15 children.

Parents are not restricted from obtaining additional services, though it is unlikely that many such services would be obtained given the lack of opportunities. The completion of the additional service form, described in the treatment verification section, provides the information needed to monitor additional services.

Treatment Verification. A number of procedures have been implemented in order to verify that treatment is being implemented as intended. They include:

1. *Collection of attendance data*. Parent and child participation in the individual sessions, as well as parent involvement in group meetings, is recorded according to length of session and staff involved. Non-attendance at regularly

scheduled sessions is also recorded according to the reason for non-attendance (e.g., child illness, holiday, etc.). Attendance data are summarized in Table 2.2 for all subjects who have been enrolled in the study for 12 months of service (see Table 2.2). These data indicate that the weekly intervention group received almost five times the number of sessions received by the control group, thus, the study closely resembles a treatment versus no-treatment comparison.

Table 2.2

Treatment Verification Data for LSU/VI Intensity Study

Variable	Low Intensity Intervention Group			High Intensity Intervention Group			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Evaluation of intervenors general work habits*	26.0		1	24.2		6	
• Total hours spent in intervention	5.7	(3.9)	9	29.9	(8.7)	8	.00
• Parent ratings of satisfaction with child's program Δ	3.6	(.6)	5	3.7	(.5)	7	.72
• Hours of additional therapeutic services received by child between pre- and posttest for 12 months							
Speech therapy	2.2	(6.7)	9	4.7	(8.2)	7	.54
Motor therapy	2.2	(6.7)	9	4.7	(8.2)	7	.54
Social work	4.4	(8.8)	9	.2	(.4)	7	.26
Respite care	0.0	(0.0)	9	.0	(.0)	7	1.00

* Total points obtained out of a possible 30.

Δ Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent; 3 = good; 2 = fair; 1 = poor) in response to seven questions.

2. *Parent report of time*. Various strategies were applied in an attempt to measure parent report of time spent working with their child for those in the weekly intervention. However, accurate information was difficult to obtain, primarily due to the naturalistic learning approach of the program. Since the interventionists stress incidental learning activities to be integrated into the parent and child's

daily routine, a discrete measure of time was not meaningful. Therefore, in lieu of a parent report of time, the interventionists rated the parents using a 10-item likert-type scale on their ability to integrate program suggestions at home. Since the parents from the low intensity, twice-monthly group condition are not observed with their child by the interventionist, ratings were not obtained from these families. These data will be analyzed in the near future.

3. *Additional services*. Parents provided information via a written form regarding any services that may have been obtained outside of the research program during the past 12 months of intervention. This information will be useful in verifying whether or not the effects are due to the treatment differences. Based on the posttest data that have been collected, few subjects are receiving a substantial amount of additional therapeutic services (see Table 2.2).

4. *Parent satisfaction and quality of parent involvement*. Given the important role that parents play in receiving services and providing services to their children, rating scales have been developed to record parent's satisfaction with the services they are receiving based on their group assignments as well as the service provider's impression of the parent's levels of knowledge, attendance, and support. Both forms are completed at posttest time. All obtained information is kept confidential. As shown in Table 2.2, parents from both groups report high satisfaction with both the interventions. Quality of parent involvement was rated on families in the high intensity group only, evaluating their general involvement, support, and knowledge.

5. *Evaluations of intervenors*. In order to assist in determining the quality of the intervention, ratings and rankings of the interventionists from both groups were completed by the program supervisors. Intervenors were rated on a 5-point scale in the areas of skills, problem solving, work habits, relationships, communication and attitude. As seen in Table 2.2, the average score for the intervenors in the

high intensity group was 24.2, from a possible total 30 points. There was only one intervenor in the low intensity group, and she received a total score of 26 out of 30. All intervenors were then compared to professionals in similar positions and rated in either the top 10%, top 25%, top 75%, or bottom 25%. Four of the six intervenors in the high intensity intervention were rated in the top 10%, and the remaining two were rated in the top 25% of their peers. The sole intervenor in the low intensity intervention was rated in the top 10%. These results reflect a quality program as viewed by staff at the Human Development Center. These ratings can be viewed as having face validity since the HDC is a university affiliated facility with model early intervention programs that is known for its services.

In addition to these measures of treatment verification, a formal on-site review was conducted on October 19-21, 1987. A detailed report has been written, and a summary of the findings is reported here. Based on observations of home intervention sessions and records as well as interviews with parents, the program was providing the services as required for the study. Due to a delay in finalizing the contract of the intervenor for the low intensity group, a parent group meeting was not observed.

There have been several changes in staff serving children in the VI study. Dr. Judith Holt, the site liaison left the project as of June 30, 1988. Dr. Holt's expertise in visual impairment is a loss to the project. However, inservice training related to programming for those with visual impairments is being provided to the intervenors via conferences and consultations with model VI programs. Patsy Poche now fulfills the role of site liaison as of September, 1988. Dr. Poche has a wealth of experience conducting research with handicapped infants and toddlers, and she has worked cooperatively with our contacts at the LSU Eye Center. The project is fortunate to have Dr. Poche to assist in its coordination.

There was also a change of staff for the speech/language therapist position, but there was no break in intervention. The social worker who is part of the team for the weekly home-visit session left in Spring, 1988; this position has not yet been filled. However, the social worker's role was not one of case manager, and therefore there as not been a significant impact on the program. The Human Development Center will continue to seek a replacement.

Cost of alternative interventions. ***Weekly home-visit intervention.*** Analysis of the cost data for the LSU VI project reflects the per child costs for the individualized, weekly home-visit intervention versus the twice-monthly parent group meetings (see Table 2.3).

Table 2.3

Cost Per Child for LSU-VI Site (1987-88)

Resources	Home-Based (N = 15)	Parent Group (N = 15)
Agency Resources		
Direct Service	$2,896	$240
Administration	2,383	156
University Indirect Cost*	884	28
Equipment	16	8
Transportation	50	0
Materials/Supplies	70	18
SUB TOTAL	**$6,299**	**$450**
Contributed Resources		
Parent Time	244	46
Parent Transportation	419	127
SUB TOTAL	**$663**	**$173**
TOTAL	**$6,962**	**$623**

*University Indirect Rate is 18%. Includes facilities, equipment, capital improvements, and some administration.

The primary expenditure for the weekly intervention group was direct service costs, which included portions of salaries for two teachers, an occupational therapist, a speech/language therapist, a physical therapist, a social worker, and a developmental pediatrician. Administrative costs included portions of salaries for the program director, the principal, the secretary, and the VI liaison (Judith Holt).

Consultant fees were accrued for employing a temporary home-based teacher for a 3-month period until a new teacher was hired. No volunteers were used in this program. Parent time was required for participating in the weekly home visits as well as for special sessions with the therapists and for programming assessments. The estimated cost of part time is based on an average wage for the United States plus benefits.

Costs for facilities included office space for all staff as well as a treatment room for consultation. This includes all associated occupancy; e.g., expenditures, utilities, maintenance. The university's indirect rate of 18% was also applied to this calculation.

Transportation expenses were accrued primarily by staff traveling for conducting the home-based intervention. However, it was necessary for three of the parents to hold their weekly intervention sessions at the center. These parents were reimbursed for their travel expenses. Information on mileage, time spent driving to the center, and carpooling was obtained via phone interviews with the parents.

Equipment costs are based on expenditures for instructional materials, such as curricula, toys, etc. Items with an expected life of greater than one year fell in the "equipment" category. Consumable materials, e.g., paper, pencils, etc. were listed under materials and supplies.

In summary, the costs of the weekly home-based intervention were roughly ten times the cost of the twice-monthly group intervention. These data will be taken into account when estimating the cost-benefits of the treatments.

Twice-monthly parent group. Direct service costs involved the consultation payments for the group leader, who organized and facilitated the group meetings. Various professionals assisted the group leader in addressing specific topics, such as general motor development, language development, etc. The guest speakers donated their time, and therefore were considered as volunteers. Total volunteer time equalled 9 hours, and the cost was estimated according to the average wage. Administration expenses included a small portion of the FTE for Dr. Holt's administrative duties.

Parent time included time spent in the group meetings. Transportation costs to parents included an average of round-trip travel time to attend meetings (based on average hourly wage) plus mileage (at .21 per mile).

The parent group meetings were conducted at the LSU Eye Center; however, the program was not charged for this space. An estimate of the cost of the facilities was obtained by applying the Eye Center's indirect cost rate of 18%.

Equipment costs for the group meetings included costs of instructional/curriculum materials (Reach Out and Teach) that have an expected life of more than one year. Materials/supplies costs included consumable items such as paper products, refreshments, etc.

Data Collection

Data on children and their families are being collected using instruments that will yield descriptive information (i.e., demographics) as well as assessing treatment effects. The majority of the instruments are ones that are consistent across all sites. However, additional posttest data will be collected using complementary measures selected to meet the unique characteristics of this visually impaired population. A description of diagnostician requirements is described below, followed by descriptions of the pre- and posttest instruments for this study.

Recruitment, training, and monitoring of diagnosticians. Five diagnosticians completed extensive training prior to administering the Battelle Developmental Inventory. All of the diagnosticians have master's degrees and extensive experience assessing handicapped infants and children. All the testers are naive to the subject assignment. All but one of the testers is employed by other departments within the Human Development Center and although they are aware that research is being conducted, they do not know the specific details of the study. Shadow-scoring was conducted on 10% of the BDI administrations, averaging 90% interrater agreement. EIRI has requested that testers who are not from the HDC be recruited. However, it is difficult to identify outside testers that have skills necessary to test children with visual impairments. Therefore, the expertise of the HDC staff has been viewed as being the critical component in obtaining valid results. Dr. Judith Holt, a specialist in the area of teaching children with visual impairments, fulfilled the role of assessment supervisor through June 30, 1988. Currently, Sarah Wewers, who holds a master's degree in special education, is serving as assessment supervisor.

Pretest. After children have been identified and assigned to groups based on their visual acuity and screening results, a core pretest battery of measures used across all sites consisting of the Battelle Developmental Inventory, Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events, and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III), is administered. Demographic information is also obtained via interview with the parent. These measures will be used as covariates in the analysis and will be used to investigate whether certain types of families or certain types of children profit more from intervention.

The BDI is administered by a trained diagnostician who is unaware of the child's group assignment. Testing occurs at the Human Development Center in New Orleans, ensuring that the testing setting is the same for all subjects.

The family measures are completed by the parent attending the testing session following the administration of the BDI. Married parents and those with spouse equivalents are also given a copy of the FSS to take home for their partner to complete. To encourage and reinforce parent participation in the assessment process, parents receive a monetary incentive of $20 for completing the pretest battery. The diagnostician scores the BDI and completes a testing report. The diagnostician does not score the family measures. All data is then transmitted to the assessment supervisor. The assessment supervisor maintains copies of all of the protocols for the on-site records and submits the original protocols via certified mail to the EIRI site coordinator within one week. Table 2.4 summarizes the pretest scores.

Posttest. Posttest measures are collected after children have been in the program for 12 months, and consist of the Battelle Developmental Inventory and the family measures previously described.

Complementary measures included the Early Intervention Developmental Profile (EIDP) (Brown et al., 1977) the Carolina Record of Individual Behavior (CRIB) (Simeonsson, 1981), Assessment of Preferential Looking, and two videotaped assessment procedures.

The EIDP is a criterion-referenced instrument that assesses all major areas of development. It was selected as a complementary measure for its large quantity of items as well as its emphasis in the assessment of sensorimotor intelligence based on Piaget's theory of development. Therefore, the EIDP could provide a different perspective on the child's development compared to the Battelle.

The Carolina Record of Individual Behavior (CRIB) was completed on each child based on the diagnostician's clinical impressions when administering the EIDP. The CRIB assesses the child's level of activity/arousal and social orientation, participation, motivation, endurance, communication, object orientation, and consolability. These are all variables that relate to the child's interaction with the environment, a key focus of the intervention with the visually impaired children in this study.

Table 2.4

Comparability of Groups on Pretest Measures for LSU/VI Intensity Study

	Active Subjects Enrolled by June 1, 1988									Subjects Included in Year #1 Posttest										
	Low Intensity				High Intensity					Low Intensity				High Intensity						
Variable	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	P Value	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ESs	P Value
• Age in months at Pretest	14.8	(10.6)		15	12.9	(12.0)		15	.65	17.3	(11.3)		9	18.3	(13.8)		8	.02	.08	.88
• Battelle Developmental Inventory (BDI)* DQs for:																				
Personal Social	76	(36)		15	69	(34)		15	.58	67	(29)		9	54	(21)		8	1.24	-.45	.28
Adaptive Behavior	64	(36)		15	61	(41)		15	.86	64	(39)		9	41	(37)		8	1.50	-.59	.24
Motor	78	(23)		15	65	(25)		15	.14	80	(25)		9	54	(20)		8	5.41	-1.04	.03
Communication	79	(29)		15	56	(30)		15	.08	77	(37)		9	51	(32)		8	2.44	-.70	.14
Cognitive	59	(32)		15	52	(30)		15	.54	66	(36)		9	40	(27)		8	2.91	.72	.11
TOTAL	73	(29)		15	61	(28)		15	.23	.71	(.33)		9	.48	(.25)		8	2.69	-.70	.12
• Parenting Stress Index (PSI) Percentile Rank $																				
Child Related (range 47 to 235)	100.9	(22.2)	57	15	96.8	(11.5)	45	15	.53	92.2	(18.8)	35	9	101.1	(10.8)	57	8	.12	.47	.74
Other Related (range 54 to 270)	119.8	(18.4)	46	15	122.1	(15.4)	35	15	.22	120.7	(22.7)	50	9	117.0	(19.7)	43	8	1.38	-.16	.26
TOTAL (range 101 to 505)	220.7	(34.7)	49	15	209.3	(20.1)	36	15	.28	212.9	(37.3)	38	9	218.1	(23.1)	46	8	.13	.14	.73
• Family Adaptation and Cohesion Evaluation Scales (FACES) †$																				
Adaptation (range 0 to 24)	6.3	(5.5)		15	7.5	(4.5)		15	.52	5.0	(5.0)		9	9.3	(5.2)		8	2.96	.85	.11
Cohesion (range 0 to 30)	9.0	(9.2)		15	11.3	(8.7)		15	.43	10.9	(11.5)		9	11.0	(9.8)		8	.00	.01	.98
TOTAL (range 0 to 54)	15.3	(10.6)		15	18.8	(9.3)		15	.34	15.9	(13.4)		9	20.3	(11.6)		8	.51	.33	.49
Discrepancy	6.3	(7.9)		15	7.8	(10.7)		15	.67	4.9	(9.0)		9	7.4	(9.9)		8	.30	-.20	.60
• Family Resource Scale (FRS)&@	132.7	(10.5)	77	15	118.1	(17.9)	50	15	.01	135.4	(11.9)	79	9	113.9	(19.9)	41	8	7.57	-1.82	.02
• Family Index of Life Events (FILE) &@	28.5	(12.2)	54	15	28.6	(10.2)	54	15	.97	32.9	(11.4)	69	9	29.9	(12.7)	57	8	.27	-.26	.61
• Family Support Scale (FSS)$	7.5	(4.9)	55	15	10.4	(5.7)	40	15	.14	7.7	(5.5)	55	9	11.5	(7.3)	29	8	1.51	.69	.24

NOTES: *Statistical analyses for BDI scores were conducted using computed scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the experimental group scored closer to the "ideal."

&Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

@No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

Δ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

$Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable. A low score indicates lower stress, fewer stressful life events, or a score closer to "ideal," respectively. These scores may be converted to percentiles using the tables in Appendix A.

The assessment of preferential looking (FPL) is conducted at both pre and posttest time through the LSU Eye Center. During testing, the child is shown stimulus displays containing black-and-white gratings of different spatial frequencies (stripe width). The child's attention to the grating is observed, and monocular as well as binocular acuity estimates are obtained. This method of assessing acuity has been proven to be effective with infants as young as one month of age (Dobson, McDonald, Kohl, Stern, Samak & Preston, 1986). The pretest preferential looking test was used to stratify according to acuity for group assignment. Preferential looking was also conducted as a posttest measure. Since acuity is one critical variable in the assessment of functional vision, posttest assessments were conducted to assist in judging the effectiveness of the intervention increasing the child's functional use of vision. The preferential looking procedure is a standardized procedure, unlike most functional vision assessments which are non-standardized with a great deal of variability in administration procedures and results.

Videotaped assessment of parent-child interaction was used to measure the effects of visual impairment on parent-child relationships. This was considered to be an important outcome given the dramatic differences in the two treatments being compared. Standardized procedures recorded in a laboratory setting were developed. The videotapes were then sent to coders who have developed systems judged to be sensitive to the desired treatment variables. *The Parent-Caregiver Involvement Scale* (Farran, Kasari, Comfort, & Jay, 1986), rates maternal behavioral descriptors on a 5-point scale across three dimensions: amount, quality, and appropriateness. Global ratings of (1) availability of parent to child, general acceptance and approval manifested by parent, general atmosphere, enjoyment, and provision of learning environment. *The Parent-Child Behavioral Observation System* (Marfo & Kysela, in press) examines behavior as a dynamic process, measuring both child and parent behaviors and how they interact. The videotapes are in the process of being coded, and raw data from the coders should be received by October 1, 1988.

Future posttesting. The posttest measures to be used during Year 2 include the Battelle Developmental Inventory and the previously described family measures. It is anticipated that the Early Intervention Developmental Profile-Preschool Assessment will be appropriate for subjects 3-5 years of age. Children under 3 years developmentally will again receive the Infant Assessment of the Early Intervention Developmental Profile. A measure of adaptive behavior is being considered in place of the CRIB when subjects reach 4 years of age. A specific measure of orientation and mobility will be more appropriate for subjects upon reaching 5 years of age. The Peabody Mobility Scale (Harley, Wood, & Merbler, 1980) is being considered. Preferential looking will continue to be assessed at follow-up posttest time.

A standardized videotape procedure for assessing exploration and play is in the process of being pilot tested for year two posttest. Both exploration (the skills used to obtain information about novelties in the environment) and play (involving the application of information obtained through exploration) are outcome measures that are not assessed through traditional assessments, and yet are behaviors that have been closely related to cognition, language, and social development. Learning through exploration and play are strategies emphasized by the high-intensity, weekly intervention group. The logistics of conducting this videotaped assessment was difficult to coordinate for this year's posttesting. Plans are being made to implement these procedures for Year 2 posttesting.

Results and Discussion

The following section presents results of the study with respect to comparability of the groups on pretest measures, and the preliminary findings of the effects of alternative forms of intervention on measures of child and family functioning. Please note that these results are not complete and discussions are preliminary. No final conclusions should yet be drawn from these data.

Comparability of Groups on Pretest Measures

As can be seen in Table 2.4, the high intensity intervention group scored slightly lower on most domains of the pretest Battelle Developmental Inventory. Though none of these differences reached a level of statistical significance when comparing pretest cores of all subject currently enrolled, there is a significant difference between groups when looking at motor domain pretest scores of subjects who have been pretested. In regard to the family functioning measures, the low intensity group scored significantly higher on the Family Resource Scale, meaning that parents of this group perceive themselves to have a greater degree of resources compared to the high intensity group.

In comparing pretest scores of subjects included in posttest analysis, there are notable effect size differences between groups on all Battelle domain scores, in favor of the low intensity group. On the family measures, the difference in scores on the Family Resource Scale was even more dramatic, with the low intensity group receiving the higher score. Given these significant differences in scores on the BDI and the FRS, these variables will be used as covariates in the analysis of differences between groups at posttest time.

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Table 2.5 summarizes the postdata for both low and high intensity subjects who have been in the study for one year. As shown in the table, 17 subjects have been

Table 2.5

Posttest Measures of Child Functioning for Alternative Intervention Groups for LSU/VI Study

Variable	Covariates[&]	Low Intensity				High Intensity						
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANOVA F	ES[@]	P Value
Average length of intervention in months	–	11.9	(9)		9	15.2	(5.7)		8	3.08	3.6	.10
Age in months at posttest	–	29.9	(11.7)		9	31.5	(15.0)		8	.14	.1	.81
Battelle Developmental Inventory (BDI) *@	1, 2									ANCOVA		
Personal-Social		101	(19.2)	100	9	68	(23)	69	8	9.45	-1.6	.01
Adaptive Behavior		89	(17)	88	9	74	(27)	76	8	.84	-.71	.38
Motor		92	(17)	92	9	58	(28)	58	8	7.42	-2.0	.02
Communication		96	(20)	97	9	75	(23)	75	8	3.71	-1.1	.08
Cognitive		83	(23)	81	9	60	(27)	63	8	1.80	-.78	.20
Total		94	(15)	94	9	70	(25)	69	8	5.27	-1.7	.04

NOTES: * Statistical analysis for BDI scores were conducted using computed scores for each of the scales by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[&] Covariates: 1 = BDI Total, Pretest; 2 = FRS Total, Pretest

posttested as of July 1, 1988. Analyses of covariance was conducted for the BDI scores using relevant BDI pretest scores and the Family Resource Scale as covariates.

Analysis of the BDI posttest data show that significant differences (p = .05) occurred between groups on the adjusted means for the personal-social and motor domains as well as the Battelle total score, with the low intensity group scoring significantly better.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 2.6 represents results of analysis on posttest measures of family functioning. One parent in the high intensity intervention declined to complete the

Table 2.6
Posttest Measures of Family Functioning for Alternative Intervention Groups for LSU/VI Intensity Study

Variable	Covariate[∞]	Low Intensity Group					High Intensity Group					ANCOVA F	ES[@]	P Value
		$\overline{X}$	(SD)	AdjX	%ile	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n			
Parent Stress Index (PSI) [*@]														
Child Related Range (50 to 250)	1, 2	103.2	(18.5)	109.8	75	9	110.3	(22.9)	103.7	64	7	.87	.33	.37
Parent Range (54 to 270)	2, 3	130.7	(29.7)	138.8	77	9	121.3	(19.6)	113.1	36	7	5.29	.87	.04
Total Range (101 to 505)	2, 3	233.9	(40.6)	247.3	77	9	231.6	(37.5)	218.2	46	7	3.56	.72	.08
Family Adaptation and Cohesion Evaluation Scales (FACES) [+*@]														
Adaptation Range (0 to 24)	4, 5	10.6	(9.7)	10.2		9	3.3	(3.1)	3.7		7	2.66	.67	.13
Cohesion Range (0 to 30)	4, 6	10.0	(9.1)	10.2		9	5.3	(4.3)	5.1		7	1.60	.56	.23
Total Range (0 to 54)	7, 8	20.6	(14.8)	19.9		9	8.6	(5.0)	9.3		7	4.74	.72	.05
Discrepancy [*]	5	.11	(13.2)	2.6		9	6.1	(4.4)	3.4		7	.03	.06	.86
Family Resource Scale (FRS) [$#@]	9	129.1	(11.7)	120.3	54	9	113.7	(21.5)	122.5	57	7	.11	.19	.75
Family Support Scale (FSS) [$#@]	10	39.5	(8.3)	37.0	77	8	31.9	(8.8)	34.4	71	7	.47	-.31	.51
Family Index of Life Events (FILE) [*@]	3, 11	7.3	(5.5)	9.4	47	9	12.6	(10.3)	10.5	11	7	.22	-.19	.65

[@] Effect Size (ES) is defined here as the difference between the groups (High minus Low) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Low Intervention Group (see Glass, 1976; Tallmadge 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analyses and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ESs are most desirable. A lower score indicates lower stress or a low number of stress-associated life events, or a score closer to "ideal," respectively. These scores may be converted to percentiles using the tables in Appendix A.

[+] Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the Expanded High Intensity group scored closer to "ideal."

[$] Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. These scores may be converted to percentiles using the tables in Appendix A.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with handicapped children).

[∞] Covariates: 1 = PSI Child Domain Pretest; 2 = Mother's Occupation; 3 = FILE Total Pretest; 4 = Number of Siblings; 5 = Adaptability, Pretest; 6 = Cohesion, Pretest; 7 = Father Present in Home; 8 = FACES Total, Pretest; 9 = Mother's Education; 10 = Hours in Day Care; 11 = Income family measures; therefore, family functioning data has been collected on only 16 subjects. An analysis of covariance was conducted for each measure, using appropriate pretest scores and demographic data. Significant differences were found on the degree of balance in family type as measured by the FACES III (Total FACES III Score), with the experimental group receiving the more balanced score. There was also a significant difference in regard to parent-related stress, with the experimental group showing a significantly lower amount of stress.

Subgroup Analysis

A number of subgroup analyses are planned once more posttest data have been collected. Two important factors to consider are the relationship between the severity of vision loss and handicapping condition with the degree of child gains. For example, upon close examination of the assignment matrix, there are more subjects in the experimental group that have mild to moderate developmental delays and/or additional mild handicapping conditions (63% of subjects), compared to the control group (33% of subjects). The effects of additional services on child functioning is also warranted, especially the impact of daycare/preschool participation on BDI scores. There was considerable variability in the attendance of subjects in both groups; therefore, the amount of intervention received will also be considered in future analysis.

The impact of vision loss, handicapping condition, and developmental delay as they relate to the family measures will also be subject to future analysis. At this point, there ar no strong relationships between various demographic variables and the family functioning measures in general. As more pretest data are collected, significant differences may be apparent; e.g., the effects of the mother's education or marital status on family functioning. There were notable, although statistically insignificant differences in the mean scores between intervention groups on the

Family Inventory of Life Events and Changes. Therefore, scores from this measure may also prove useful in subgroup analysis.

Conclusions

Given the small sample on which the posttest analyses were conducted (n = 17), the results presented here must be interpreted with caution. This is especially true in light of differences between groups in regard to Battelle pretest scores and degree of handicapping condition/developmental delay. As previously mentioned, the groups are skewed, with more children in the high intensity intervention having a greater degree of handicapping conditions and/or developmental delays. As more subjects ae enrolled and posttested, these differences should be eliminated.

Additionally, the Battelle Developmental Inventory is the only child outcome measure that has been analyzed. The complementary measures (the Early Intervention Developmental Profile, parent-child interaction, and forced preferential looking), may result in more sensitive indicators of child functioning than the Battelle.

Based on the preliminary analysis completed using the family functioning measures, there appear to be significant differences in favor of decreased overall stress and the increase in balanced family types for the high intensity intervention. This could be interpreted to mean that the weekly home-based treatment is assisting the parents in feeling more comfortable with their role of caregiver, and in turn results in a more balanced family system. Again, further data collection is needed before such treatment effects are considered valid.

Future Plans

Plans for FY 88-89 involve the continuation of the two groups as described. New subjects will continue to be enrolled at the rate of one to two children per month, resulting in a final sample size of approximately 50 children. Year 1 posttesting will continue as children complete 12 months of intervention, reaching a total of 31 subjects on which posttest data will be completed by July 1989.

Approximately 16 subjects will receive Year 2 posttesting by July, 1989. Changes in posttesting procedures for Year 2, as discussed earlier, will include a measure of exploration/play behavior addition to the measures used in the Year 1 posttest battery.

Given the change in the site liaison at the Human Development Center, there will be an increase in site contacts to ensure that the research continues to move smoothly. An on-site review is planned for mid-November to ensure that high-quality intervention services continue to be provided.

CHICAGO PUBLIC SCHOOLS - PARENT-INFANT PROGRAM
Project #3

COMPARISON: Hearing impaired children, five hours per month versus 13 hours per month of intervention.

LOCAL CONTACT PERSON: Liz Daily

EIRI COORDINATOR: William E erman

LOCATION: Chicago, Illinois

DATE OF REPORT: 10-7-1988

Rationale for the Study

In February of 1988, the report from the President's Commission on Education of the Deaf was published which, among other issues, stressed the importance of appropriate services being provided to deaf children in the early years. "We feel a deep concern about what occurs in the early years of a deaf person's life... Failure of the educational system to supply the spectrum of services to which a deaf child is entitled under the provisions of the Education of the Handicapped Act (EHA) can - and all too often does - stunt an individual's natural growth toward mature, fully functioning adulthood; or, in a word, toward equality" (1988, p.9).

Language learning does not occur as spontaneously for deaf children as it does for hearing children. In fact, the major barrier associated with deafness is related to language development and communication. "Many children who are deaf, unlike most children who hear, enter the educational system without a competent language base" (President's Commission on Education of the Deaf, 1988; p.16). While the process of learning language for deaf infants and toddlers is complex in and of itself, this population is also at a disadvantage in gaining knowledge about the world, and placing experiences in appropriate contexts. As a result, special intervention is usually necessary to compensate for this rupture in the process through which most hearing children learn about themselves and their world.

The field of deaf education has developed a number of approaches to address the needs of young deaf children and their families including alternative communication modalities, amplification methods, and learning experiences to provide them with experiences similar to those of hearing children. Providing such experiences for deaf children must be more deliberate, carefully planned and monitored than what is necessary for a hearing child. As the field of deaf education has progressed, several assumptions have been made about how to address the needs of young deaf children. One of those assumptions is that the more time spent by deaf children and their parents in focused, carefully planned, and deliberate interventions, especially interventions heavily focused on language development, the more progress deaf children will make toward overcoming their disability with respect to language and other cognitive and social skill areas.

Relatively few data exist, however, about the costs and effects of early intervention with young hearing impaired children. Those studies which have been conducted have focused primarily on curriculum comparisons or on pretest-posttest designs for individual intervention programs (Craig, 1964; Greenstein, 1975; Horton, 1976; Prinz & Nelson, 1984; Utah School for the Deaf, 1972). Well-designed research studies examining alternatives in treatment intensity for hearing impaired children are lacking. Furthermore, service providers such as the staff of the Chicago Public School's Parent-Infant Program do not believe that the current level of services of 1 one-hour per week, which is currently the maximum available in that area, is sufficiently intense to make optimal progress toward meeting the needs of the hearing impaired infants and toddlers they have enrolled. The "more is better" assumption has not been empirically established, however, and, perhaps this is part of the reason more intense programs for these young children are often not fully funded. Therefore, to meet the needs of young hearing impaired children, the field of deaf education must ask the critical question, "Is more better?" Furthermore, the type of additional services that can lead to optimal progress in the children must be examined.

Since the current level of services at the Chicago Parent-Infant Program is minimal, and since expanded services can feasibly and ethically be provided with the support of this study, this setting provides an excellent opportunity for assessing the costs and effects of two different intensities of early intervention services to hearing impaired children.

Program Orientation

The Chicago Public Schools offers a noncategorical Parent-Infant Education (PIE) program operated at the Skinner School in downtown Chicago. Staff consists of eight teachers and several support personnel who provide assistance to approximately 140 parents of preschool handicapped children. These children range from a few months to three years of age and represent a wide variety of handicapping conditions. The current PIE intervention includes the parents, usually the mother, and the child, in weekly hour long sessions during which staff work with mothers and the children in individualized settings. The objective of the sessions is to provide the parent with a diverse repertoire of interventions and instructional games which will aid in the development of the child. At these sessions, the general developmental progress of the child is noted by the teacher, and problems in rearing and teaching the child are discussed. Hearing impaired children represent a small portion of the total population served by the program; typically only about 20 children. The intervention customarily provided to hearing impaired children and their parent focuses primarily on langauge acquisition.

Methods

The following procedures are being used to implement the study.

Subjects

There are currently 20 children between 22 months and 36 months availbable for assignment in the study. The average hearing loss is 82 dB in the better ear which reflects a range of 65 to 105 dB losses for the currently available hearing impaired infants.

Recruitment. Twenty 0- to 3-year-old children with moderate to profound hearing losses (unaided pure-tone scores of 60 dB or greater in the better ear) will be randomly assigned to the two treatment conditions after stratification by age and degree of hearing loss. The population in the area to be served is mostly urban, intercity with a wide range of socioeconomic variability. About 60% of the population is black, 20% hispanic, 10% asian, and 10% caucasian. Twenty subjects have been identified and will begin services on October 1, 1988 in the PIE program. It is likely that an additional 10 children will be identified from other programs in the Chicago area and referred to the PIE program before January, 1989.

Children qualify for participation in the project on the basis of their hearing loss and their age. Children with pure-tone hearing losses of 60 dB or greater in the better ear and no older than 3 years of age who live in geographically-targeted areas are eligible for participation. The hearing cutoff was established so as to include only those children whose hearing losses were significant. The age range established will allow for the older children to be enrolled for a full year of intervention services before their fourth birthday when they typically tansition into a 5-day per week school-based program.

__Assignment to groups__. A pure tone audiometry assessment is conducted by a licensed audiologist (certified by the American Speech and Hearing Association), and is used for identification and assignment purposes. Unaided scores, rather than aided scores are used because a number of potential subjects have not yet been fitted with hearing aides.

Children who meet the age and hearing requirements are included as potential participants. After the regional directors have obtained informed consent agreements from the children's parents, the local site contact transmits the information to the EIRI coordinator along with the hearing loss and age data (the two stratification variables). The children who are referred are then stratified by hearing loss and randomly assigned to groups.

All assignments to groups is made by the EIRI coordinator to ensure that no program staff have prior knowledge of where a particular child will be placed. Additionally, the dates in which children are identified will be carefully tracked to ensure that children are assigned in the order in which they were identified.

Intervention Programs

The research study will compare two interventions; the current service model and a more intensive, heavily language-based model which will be provided to hearing impaired children served by the Parent-Infant program in the Chicago Public Schools.

Current intervention model. Currently, the Chicago Public School's Parent-Infant Program is providing a once-per-week center based service, along with a monthly home-based visit, to 20, 0 to 3-year-olds who have hearing impairments. Additionally, hearing impaired children from other programs in the Chicago area will be identified for inclusion in the study. The Parent-Infant Program provides training to parents which will enable them to engage their child in meaningful developmental activities. These activities vary from auditory and visual stimulation to motor, language, and concept development, using a curriculum designed by PIE over the past five years.

Each parent is encouraged by the therapist to follow instructional guidelines that will enable them to facilitate and enhance the learning process. Parents receive instructions from the therapists during once a week one-hour sessions at the school, and one one-hour home-visit per month. During these sessions, the child's progress is assessed and instructional changes are made.

Intensified model. The increased services will consist of one two-hour individualized, and one one-hour small group center-based visit per week, plus a monthly one hour home-based visit. Parents and children will be transported to and from the program on district buses. Children would be randomly assigned to one of the two groups and would receive the treatment for a minimum of nine months. All children and their families would receive a comprehensive assessment at the beginning and ending of each year using core measures for the study as well as any additional measures mutually agreed upon with the Parent-Infant Program. The study would be run on an on-going basis (on-going enrollment and assessments) for two school years through September of 1990. All children and families will be tested annually, whether they have graduated from the program or not. Summer school sessions will also be provided. Although it is not possible to offer full services during the summer, an intensity difference of similar proportion will be offered.

Other than the difference in the frequency of center attendance and the extra emphasis on language, all aspects of service will be the same as for the standard services group. Regional coordinators will keep a "visit by visit" log of interventionist's home visits. This will ensure that home visits are occurring consistently in both the standard services group and the expanded services group.

Optional Services. Several optional services are provided equally to the two groups. These include a parent group meeting every 4 to 6 weeks and medical and local service agencies which are available to parents. The extent of their participation will be monitored by completion of the Additional Services form at posttest.

Treatment verification. A number of procedures are being used for purposes of verifying that the treatments are being implemented as intended. First, initial agreements are being made between the EIRI coordinator, the Parent-Infant Program coordinator, the regional coordinators and the individual interventionists pertaining to the actual types of services which will be provided, the intensity and duration of these services, record keeping of each child's activities pertaining to these services, attendance records and any other records which may facilitate a detailed description of each of the treatments as they are provided to the children and their families. Second, the regional coordinator with the Chicago Public Schools will closely monitor the activities of the interventionists, keeping a record of their home visit activities, periodically accompanying interventionists on home visits in order to provide feedback on their approach, and implementing other monitoring activities on a regular basis. Third, the Parent-Infant Program coordinator will correspond with the regional coordinator, minimally once a week, to discuss new subject enrollment, testing, any service delivery difficulties and to transmit communications between regional coordinators and EIRI pertaining to attendance data, attrition, and/or new enrollments. Fourth, the EIRI coordinator will be in weekly communication via telephone with the Parent-Infant Program coordinator to discuss any concerns raised by any of the coordinators as well as any of the issues detailed above. Fifth, both Parent-Infant and EIRI coordinators will make periodic site visits (the Parent Infant Program coordinator will visit more frequently than the EIRI coordinator, but will report the events of each visit to the EIRI coordinator). These site visits will include meetings with each regional coordinator and, when possible, with interventionists. Sixth, as mentioned, daily attendance records will be kept and submitted to the EIRI coordinator on a monthly basis. These records will include information about daily attendance, length of each session and a list of staff involved in each session. Seventh, parents will be reporting by means of weekly postcards how much time they spend with program staff and how much time they spend working with their child on suggested activities. Eighth, a formal site review will be conducted annually to ensure treatments are implemented as intended and that all predetermined procedures are being followed as specified. The site review will consist of the following: a cumulative review of six subjects' folders, direct classroom and home visit observations, interviews with interventionists and interviews with three parents.

Cost of alternative interventions. Costs will be assessed using the ingredients approach described earlier in this report. No cost assessments have been made at the time of this report.

Data Collection

A number of procedures will be followed to ensure data are collected in the most objective and reliable manners.

Recruitment, training and monitoring of diagnosticians. Diagnosticians will complete extensive training prior to adminstering the Battelle Developmental Inventory and other measures selected for the study. All of the diagnosticians will have experience working with hearing impaired children and will possess masters degrees. Each tester will be naive to the group assignments of those they test. Shadow-scoring will be conducted on 10% of the testing and interrater agreement will be computed.

Pretesting. The basic core measures which will be completed for each subject are described below. Parents will be paid $25 for each testing session (pretest, posttest, and subsequent posttests).

The core pretest battery consists of the Battelle Developmental Inventory (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984), Parenting Stress Index (Abidin, 1983), Family Resource Scale (Leet & Dunst, 1985), Family Support Scale (Dunst, Jenkins, & Trivette, 1984), Family Adaptability and Cohesion Evaluation Scales (FACES III) (Olson Portner, & Lavee, 1985), and Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983).

Additionally, assessments (which have yet to be determined) specific to the goals and objectives of the program will be used (i.e., language samples, standardized speech and language tests, parent/child interaction, etc.)

***Posttest*.** The core posttest measures will be collected in the spring of each year and will consist of the BDI and the other parent measures discussed above. Additionally, a parent satisfaction with treatment questionnaire and parent report of child's health will be administered to the parents.

Complementary measures have been chosen to reflect gains made in language ability as well as social gains which are expected to be the result of the expanded services treatment which will be heavily emphasizing language and grammatical development and which provides children with the opportunity to interact with their peers on a daily basis. Measures which have been selected include the Peabody Picture Vocabulary Test, the Meadow Kendal Social Emotional Developmental Inventory for Deaf Students, and the Grammatical Analysis of Elicited Language.

Data Analysis

Data analysis will be conducted on pretest measures comparing the two treatment groups. Additionally, pretest analyses will include comparisons across each of the stratification variables. Posttest data analyses will be conducted using the pretest data as covariates in order to control for any preexisting differences between treatment groups.

SUNSHINE PRESCHOOL--RICHARDSON CENTER

Project #4

COMPARISON: Mildly to Severely Handicapped Children -- Home-based intervention 4 times per month versus home-based intervention 8 times per month.

LOCAL CONTACT PERSONS: Lowell Collins, Coordinator (Sunshine Preschool); Janice Hardin, Ed.D., Coordinator (Richardson Center).

EIRI COORDINATOR: Chuck Lowitzer

LOCATION: Benton County, Arkansas, and Fayetteville, Arkansas.

DATE OF REPORT: 10-7-1988

RATIONALE FOR THE STUDY

Limited evidence in the existing literature is available to guide programming decisions concerning the relative effectiveness of various intensities of early intervention (White & Casto, 1985). The frequency and intensity of early intervention services vary across program models based largely on philosophical orientation and professional judgement of individual child needs. This study was designed to respond to the practical need identified by service providers requesting data based guidelines for use in determining what is the most appropriate service intensity to provide. The study provides a comparison of the effectiveness of two levels of intensity of home-based service for children from birth to five years old.

Review of Related Research

Currently, parents and professionals often make decisions regarding the form services should take based only on their experience and/or philosophy of the human condition (Fredericks, 1985). Rarely are the program models, approaches, or curricular contents evaluated in a systematic manner (Switsky & Haywood, 1985). The field lacks empirical findings in many areas critical to the training and education of severely handicapped young children. The treatment intensity issue is of particular importance in programs serving moderately and severely handicapped young children. Although research in this area is sparse (Bailey & Bricker, 1984), Casto and his colleagues have reported on a series of meta-analyses that indicate that intensity of intervention may be an important variable with handicapped children (Casto, 1988, 1987; Casto & Mastropieri, 1986). Specifically, Casto and Salehi (1987) found that as intervention time increased from less than two hours per week to over 20 hours per week, the intervention effect size increased from .59 to [illegible]. When adjustments were made for age at start of intervention, quality of outcome measures, and time of measurement, the range of effect sizes was .45 to .88, again in favor of more intense interventions. These encouraging findings, however, must be viewed with caution because many studies included in the analysis were confounded by the investigators' failure to distinguish intensity and duration of intervention and/or their failure to include other important variables in the analyses. Continuing literature searches by White and his colleagues (White, 1986; White & Casto, 1985) have failed to find studies that have systematically compared intervention programs that varied solely on the intensity of intervention.

Bricker (1986) described a common service delivery model for children from birth to 3 years of age that includes individualized sessions with the child and primary caregivers conducted on a one-hour-per-week basis. The model is considered both practical and cost-effective in that children in this age range have relatively restricted developmental needs, and parents are provided support and training in relevant teaching/caretaking skills. Whether increasing the frequency of visits to twice per week is effective from a developmental or cost perspective remains at issue.

The research reported here assessed the impact of the two intensity levels (once a week versus twice a week home visits) on both child and family outcomes. The study addressed the methodological weaknesses of earlier works in a variety of ways. Children were randomly assigned to groups, and diagnosticians were naive as to group assignments of subjects. A variety of child and family measures were used, and a series of treatment verification procedures were conducted. Cost data were also collected.

This research represents an effort to fill a gap in the early intervention literature. The effects of varying the intensity of service were investigated within the framework of Family Systems Theory (Haley, 1976, 1980), which provides a conceptual basis from which to study the impact of early intervention on handicapped children and their families. A variety of factors that influence the developing child are included in this framework, and several factors considered most important were evaluated in the present investigation. Specifically, family demographics, sources of support available to the family and child, family interaction style, and parental stress were measured. Because home-based delivery systems require significant amounts of parent time, and because some data suggest that interventions requiring substantial parent time may actually increase stress and disrupt family functioning (Turnbull, Summers, & Brotherson, 1983), parent involvement was also assessed. Attention was also paid to the differential effects of intervention intensity on children with varying levels of severity of handicap. Finally, teaching quality and adherence to the research protocol were monitored.

Overview of Study

Seventy children were randomly assigned to receive home-based intervention either once or twice per week. Additional services such as speech and physical therapy, when needed, were also provided on a 2-to-1 basis.

The children and their parents completed a battery of tests prior to intervention and again after approximately 8 months. Forty-four of these children have been enrolled in the program long enough to complete a second round of posttests one year after the first set.

Results indicate statistically significant differences only in the area of children's communication development as assessed by the Battelle Developmental Inventory (BDI). Children in the twice-per-week group performed better than those in the once-per-week group. This difference did not appear in the second round posttest data, but a difference was found in the Expressive Language Domain of the Sequenced Inventory of Communication Development. It was suggested that this test may be a more accurate measure than the BDI, but further data are needed to confirm this.

Methods

Program Organization

The Sunshine Preschool and Richardson Center have been funded since 1976 under the Arkansas Developmental Disabilities Council to serve handicapped individuals not being served by the public schools due to either age or severity of handicap. The two programs are administered by on-site coordinators who manage the research. The Sunshine program serves children from birth to school-age, and the Richardson Center serves persons from birth to adulthood; at the preschool level, each has a home- and center-based program for children with handicaps. The Sunshine Preschool program was selected for inclusion in the study based on the type and quality of the program, and in the willingness of staff to provide expanded services to a randomly selected group of children. The Richardson Center joined the study six months later, when staff decided to begin providing home-based services to children under age 3. The preschool supervisor at the Sunshine Center provided training to home teachers at the Richardson center, and the two centers continue working together to provide preschool programs for children with handicaps in Northwest Arkansas.

Prior to the initiation of the research, the Richardson Center program was entirely center-based, serving children on a schedule that was agreed upon by parents and center staff. Because of serious attendance problems, staff were not satisfied that the center-based delivery system was the most effective system available for serving young handicapped children. They looked to the Sunshine Center as a model for home-based delivery. When the director of the Richardson Center decided to adopt a home-based model, she was invited to participate in the research. The staff at Richardson were then trained and evaluated by the Sunshine preschool coordinator. Richardson has a staff of approximately 30 professional and paraprofessionals. There are two home-teachers, a speech and a physical therapist involved in serving the children in the study. Richardson also has six classrooms and a vocational workshop serving handicapped persons.

The Sunshine school has two separate facilities that house classrooms, offices and a vocational program. Sunshine has a larger staff and serves more clients. Both Sunshine and Richardson have as goals for preschoolers to develop functional, generalizable skills that enhance development. Both centers transition children into public school special education programs, and continue to provide school age services to the most severely disabled. Prior to our research, the Sunshine Center operated its home program much as it does now. The average frequency of home visits was once every week or every two weeks depending on the severity of the child's handicap.

Subjects. Subjects for this study were 70 children from birth to four years of age (at the time of enrollment) who were determined eligible for early intervention services according to Arkansas Developmental Disabilities Division standards. Children involved with this research project qualified for participation in home-based programs on the basis of their age and the severity of their handicapping condition. For each child who met the study criteria, parents signed an informed consent indicating willingness to participate in either the high intensity or the low intensity conditions based upon placement by random assignment. Children were not enrolled in the study if over 48 months of age. This ensured that all participants received a minimum one year of treatment before graduation to public school programs. The children were initially screened using the Developmental Profile II (Alpern, Boll, & Shearer, 1980). If they were functioning significantly below age level, further individualized assessments were administered. A child who completed 75% of items at his/her age range was excluded from further evaluation. Individual assessments included general developmental measures, and speech, occupational, and physical therapy evaluation.

__Recruitment__. All families with children receiving services prior to the 1986-87 academic year and all new referrals during that year were approached by personnel from the Benton County Sunshine Preschool or the Richardson Center for possible participation in the study. Of those approached, approximately 90% agreed to participate. Because recruitment continued until December, 1987, some subjects have been posttested twice, and some only once.

__Assignment to Groups__. A total of 86 3- to 48-month-old children with mild to severe developmental delays were randomly assigned to the two treatment conditions after stratification by chronological age and developmental functioning level as assessed by the Battelle Development Inventory or the Developmental Profile II. Random assignment was made by the roll of a die after stratification by chronological age and severity of handicap. Three age levels (0 to 20 months; 21 to 36 months; and 36 to 48 months) and three levels of handicap (severe [< 25th percentile]; moderate [25th to 50th percentile; and mild [51st to 75th percentile on the Alpern-Boll]) were included for stratification purposes. For a complete description of assignment procedures, see the 1986-87 Annual Report.

__Demographic characteristics__. Pretest demographic data for subjects who completed first posttesting are presented in Table 4.1. The population in the area served was primarily rural. The ethnic background of the subjects was predominately Caucasian (96%). Family incomes ranged from less than $5,000 to $39,999, with 30% falling into the low SES category (below $15,000). The average number of years of education for parents was between 11 and 12 years for both groups.

Table 4.1

Comparability of Groups on Demographic Characteristics for Sunshine/Richardson Treatment Intensity Study

Variable	Low Intensity			High Intensity			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age of child in months as of 7/1/88	46.2	(15.0)	29	45.5	(12.9)	41	.87
• Age of mother in years	30.4	(6.8)	28	30.4	(7.3)	41	.93
• Age of father in years	32.4	(7.5)	28	32.7	(8.2)	40	.86
• Percent male*	62.1		29	63.4		41	.08
• Years of education for mother	11.5	(2.1)	29	12.3	(2.1)	41	.12
• Years of education for father	11.7	(1.4)	28	12.2	(2.4)	40	.44
• Percent with both parents living at home	100.0		29	100.0		41	.37
• Percent of children who are caucasian*	97.0		29	95.0		41	.78
• Hours per week mother employed	8.7	(15.7)	29	19.2	(21.0)	41	.03
• Hours per week father employed	33.9	(21.1)	28	41.1	(17.7)	40	.13
• Percent of mothers employed as technical managerial or above*	0.0		29	12.2		41	--
• Percent of fathers employed as technical managerial or above*	7.1		28	20.0		40	.15
• Total household income^	$15,552	(9,381)	29	$17,720	(10,511)	41	.38
• Percent receiving public assistance	31.7		29	53.7		41	.88
• Percent with mother as primary caregiver*	86.2		29	82.9		41	.71
• Percent of children in day care more than 5 hours per week*	7.0		29	5.0		41	.73
• Number of siblings	1.8	(1.8)	29	1.3	(1.2)	41	.28
• Percent with English as primary language	100.0		29	100.0		41	1.00

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

^Means and standard deviations for this variable were estimated from categorical data.

Intervention Programs

The high intensity intervention was an expansion of the basic service that was delivered prior to the initiation of the research. It consisted of eight home sessions per month and was compared to a lower intensity of four times per month. The service ratio between groups was 2:1, with the high intensity group receiving two home visits a week versus low intensity receiving one.

Basic intervention group. The basic intervention group has received an average of 4 intervention visits per month from trained paraprofessionals, similar to the model described by Bricker (1986). The program coordinator (home teacher) was responsible for training. The home teachers spent 2 weeks in individualized training, and were then closely supervised by the preschool supervisor on their first home visits. There were 7 home teachers, of whom 2 had baccalaureate degrees, and all had extensive experience and background in early intervention.

In addition to home visits, motor and speech/language therapists provided individual therapy to children whose evaluation data indicated a therapy need on a weekly basis. The children were brought to the center for their therapies that last approximately 1/2 hour. The home-based intervention took place primarily in the subject's home, although a small number of children were visited in daycare centers or at baby sitters. The home teachers focused on working with the children directly. The parents were expected to observe and model. Home visits lasted approximately one hour.

An Individual Education Plan (IEP) was developed for each child and was used to guide the educator in working with the child and parent(s) during the sessions. The content of the home visits was taken from the IEP, which was based on (1) recommendations made by the multidisciplinary assessment team, which typically included a psychologist, speech/language pathologist, OT/PT, educator, and the child's parent, and (2) jointly agreed upon goals of the educator and the parent, considering the parents' needs and the child's progress over time. A variety of assessment instruments and curricula (such as the Early Learning Accomplishment Profile and the Hawaii Early Learning Profile) were used to develop the specific objectives in the IEP.

Intervention programs provided by the home teachers and therapists were individualized and based on the child's developmental level and the family's functioning. All children were provided with functional programs. The goals included self-help (particularly feeding), gross motor, and communication skills. The primary care taker was required to demonstrate skill in positioning, feeding, and in 15 cases, medical technology such as oxygen, respirators, gavage feeding, and catheters. The home teachers were highly specialized in these areas and helped parents meet the medical as well as developmental needs of their children. The less severely handicapped children received equally individualized programs to meet their language, cognitive, self-help, and gross and fine motor needs.

Home teachers were individually assigned to children based on the children's level of functioning. Three of the 7 teachers had extensive experience with the severely handicapped. The other 4 teachers had strong early childhood backgrounds. Each teacher was observed at least 2 times annually by the EIRI staff coordinator and has consistently demonstrated knowledge, creativity, and sensitivity in dealing with young children who are handicapped. Each teacher served an approximately equal number of children in both high and low intensity groups.

The home visit typically consisted of the following activities: warm-up play period, discussion of current concerns and child's status, direct 1:1 programming designed to meet specific objectives, work with the parents, discussion of progress made towards objectives, and data recording. When ending the visit the teacher reminded the parent of the next visit and of any scheduled therapies. She left data sheets, program descriptions, detailed instructions, and materials for the parent to use, and gave the parent encouragement and praise. Program data and anecdotal notes were recorded for each home visit.

The curriculum was based on comprehensive assessments and is basically a modification of the Learning Accomplishment Profile. The home teacher brought a variety of materials and toys for programs and the child's folder for recording data. She worked individually with the child, keeping data on 4 to 6 goal areas. Every attempt was made to involve the parents in the activities. For example, the home teacher demonstrated how to position a child for feeding and provided direct modeling, shaping, prompting, and positive reinforcement to the parent. Once the teacher had instructed the parent on how to carry out the activity, a schedule was set up for the parent to follow. The amount of time a parent was expected to spend with the child depended on the child's needs and the parent's willingness and ability. The time parents reported spending ranged from 10 minutes to over 2 hours.

The teachers created data recording sheets for parents that included the following: 1) a specification of the activities to be conducted; 2) spaces to record data and duration of activity; 3) spaces to record correct responses and errors, as well as progress made towards the objective. In some cases the only data recorded by parents was whether or not the activity took place, or how the activity went. For example, in a feeding program, the key data recorded would be that the child consumed 2 ounces orally.

During home visits, the teachers kept more detailed data on number of trials, correct and error rates, and a specific description of what progress took place towards each objective. The teachers' anecdotal records described the session, the parent's and child's response, and plans for the next session.

The IEPs were evaluated by the multidisciplinary team on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary and shared with the multidisciplinary team.

High intensity group. The high intensity group received exactly the same type of service delivery as the low intensity group, but with an average of 2 times per week for home visits and center-based therapy .

Optional services. The two centers offered parent training and support sessions to parents on an intermittent basis. These were optional services and typically did not draw a majority of the parents. There were also play groups organized for purposes of socialization. Due in part to the rural nature of the program and transportation problems, neither parent groups nor play sessions were well attended.

Treatment verification. A number of procedures were used to verify that the interventions for the two different experimental groups were being implemented as intended.

The EIRI coordinator communicated on at least a weekly basis with the on-site coordinator, assisted in areas of program developmental and child find efforts, placed all children into service options and made periodic site visits. The site has been visited 3 times this year by the EIRI site coordinator. Other program verification activities included:

1. Collection of attendance data. The child's participation in the program for both groups was recorded according to the length of the session and the staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance. Table 4.2 indicates that the home visit ratio was approximately 3 to 1, and the therapy services ratio was about 1.7 to 1.

2. Parent report of time. Twice during the year, parents were asked by home teachers how many times during the previous week they had worked with the child on structured activities suggested by the teacher and how much time was spent on those occasions. These data were intended to document how much time parents spend implementing the program. This was initiated to assure that true group differences

Table 4.2
Attendance Data

Variable	Low Intensity $\bar{X}$	(SD)	n	High Intensity $\bar{X}$	(SD)	n	ANOVA F	ES	P Value
o Total home-based visits	13.5	(7.8)	26	33.1	(18.1)	42	2.7	2.5	.00
o Total hours of additional therapeutic services received by child between pre- and posttest	149.4	(369.0)	28	252.1	(478.0)	40	.91	.28	.34

in intervention are taking place. This information is important, for example, if a low intensity parent spends as much time as a high intensity parent in carrying out program related activities, then there is far less of a group difference.

3. Data describing the quality of parent involvement has been collected. Staff members rated parents in 3 areas: attendance (in IEPs, meetings, therapy, home visits), knowledge regarding their child and rights, and support activities (follow through, communication with staff, form completion, etc.) Parents were rated in each area using a 3-point scale, 1 = low, 2 = average, 3 = high. Results indicated significant group differences exist in parent knowledge and support, and significance was approached in attendance. Table 4.3 indicates that parents in the high intensity group were rated higher than those in the low intensity group. These differences are discussed below as a subgroup analysis.

4. Teacher evaluations: The preschool supervisor evaluated teachers using scales developed by EIRI staff. One was a 3 point scale (3 = criteria fully met; 2 = partially met; 1 = not met) that addressed the following areas: teacher assessment skills; IE, development skills, IEP implementation skills, presentation of instruction, and instructional environment. The second assessed the following teacher traits on a 5 point scale (5 = outstanding; 4 = very good; 3 = good; 2 =

Table 4.3

Teacher Ratings of Parent Involvement

	Low Intensity			High Intensity					
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ANOVA F	ES	P Value
o Intervenor Ratings of Parents*									
Involvement with program	2.0	.78	29	2.3	.69	41	3.00	.42	.09
Knowledge of child's condition and program	1.8	.85	29	2.3	.74	41	4.35	.51	.02
Support of child's program	1.7	.77	29	2.2	.82	41	4.57	.63	.00

NOTE: *Scores based on a 3-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family.

needs improvement; and 1 = inadequate): teaching skills, problem solving, work habits, relationships, communication skills, and attitude. Four of the seven teachers achieved perfect scores in all areas, one received one rating of '2' on the first scale and one '4' on the second, and the other two, respectively, received '4's in three and four areas of the second scale. These ratings were consistent with those given in the first year of the project, in that teachers were ranked in the same order as last year, and reflect improved performance on the part of those teachers who did not receive the maximum score.

5. Site Review: A formal site review was conducted on May 11-13, 1988, as a part of a continuous effort to verify that treatment is taking place as planned. The EIRI Site Coordinator met with both Richardson and Sunshine Coordinators as well as with parents, ancillary staff and all home teachers. In addition, the EIRI Site Coordinator attended 7 home visits to observe each teacher at work.

Results of the site review indicated that the project is well organized and implemented. The program files were in good order, containing up-to-date IEPs, quarterly reports of progress, assessment information and description of services received. Seven IEPs were randomly selected for detailed review and all of them contained the following: 1) a statement of current level of performance (both norm and criterion referenced), 2) annual goals and short term objectives that were functional, appropriate, and individualized, 3) evaluation criteria for determining when objectives were met, and 4) timelines for monitoring.

The same folders were reviewed for assessment information and evidence of a multidisciplinary approach was indicated through speech/language, OT & PT evaluations. In addition, criterion-referenced measures such as the Hawaii, and the ELAP were in evidence in all the folders.

The site visit observations were in general very positive. The teachers demonstrated well-organized lesson plans, procedures for data collection, appropriate use of materials and activities, good rapport with the families and excellent skills with young handicapped children. The home teachers were primarily paraprofessionals; however, their teaching demonstrates excellent experience and training.

Both the Sunshine and Richardson programs included state-of-the-art procedures for transitioning children into other programs. Transition plans include discussions of the transition with parents, taking parents to visit new programs, conducting meetings with parents and current and future staff, and often sending a home teacher with the child for the first few days. A follow-up system had been developed and program staff maintain contact with parents and the staff who have received the child.

Based on the site review, it was determined that treatment has been implemented as planned. The site had requested technical assistance in the areas of functional programming for the severely handicapped and activities to meet family needs. The EIRI site coordinator did a workshop with them in January 1988 on assessment and functional skill development for severely handicapped.

Cost of alternative interventions. Data from the economic evaluation are presented in Table 4.4. These figures were computed using an ingredients model for cost estimation. Data indicate that providing twice the standard intervention doubles the cost of services for a home-based model. This relationship holds true whether or not costs of parent time are included.

Data Collection

Data are collected at enrollment and annually thereafter on all study participants.

Recruitment, training, and monitoring of diagnosticians. Three diagnosticians and a local assessment supervisor were trained to administer the BDI and certified by EIRI standards. Professors at local universities and professionals in local social service agencies were asked if they or others they knew were willing to do testing

Table 4.4

Cost Per Child for Sunshine School/Richardson Center (1987-88)

Resources	High Intensity (N = 27)	Low Intensity (N = 36)
Agency Personnel:		
Direct Service	$3,874.02	$1,937.01
Administrative	1,480.97	740.49
Facilities	501.20	250.60
Equipment	104.98	52.49
Materials/Supplies	217.33	108.66
Staff Transportation	352.42	176.21
Miscellaneous	720.85	360.44
Subtotal	**$7,251.77**	**$3,625.90**
Contributed Resources:		
Parent time	965.90	635.25
Parent Travel	463.85	231.92
Volunteer	33.60	16.80
Subtotal	**$1,463.35**	**$ 883.97**
TOTAL	**$8,715.12**	**$4,509.87**

for us. Several graduate students were recommended, four of whom were selected for training. These individuals were expected to view videotapes of administration procedures for the Battelle Developmental Inventory (BDI), review the BDI administration manual, and complete a self-test of BDI procedures before attending a two-day training session. The training session addressed all facets of the BDI, and included a competency test. Finally, after training, testers performed three practice tests, one of which was both shadow scored and videotaped by the coordinator. The videotape was sent to EIRI for review, and an interrater agreement of .80 was required for certification.

The graduate student who was closest to finishing his Ph.D. degree (which has now been completed) was selected as an assessment supervisor. The diagnosticians possessed masters degrees in psychology. The assessment supervisor was responsible for shadow scoring 10% of each diagnostician's test administrations, scheduling testing, and collecting, reviewing, and sending all protocols to the EIRI site coordinator.

Inter-rater reliability for BDIs that were shadow scored was calculated by dividing the number of agreements by the total number of items administered. A reliability coefficient of .95 indicates that the testers are performing well. None of the diagnosticians were associated with the Sunshine or Richardson Centers before or after the study began, and none were told of the group assignments of the children they tested. The purpose of the study was described in a general way as an investigation of early intervention procedures.

Pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. Children were administered the Battelle Developmental Inventory, and parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Inventory of Life Events and Changes, and the Family Adaptability and Cohesion Evaluation Scales as pretest measures. Parents were paid a $20 incentive for pretesting. Information from these measures will be used as covariates in the analysis as well as for investigating whether certain types of families or certain types of children profit more from intervention than others.

Posttest #1. First year posttest data are now available on 70 children. Data were collected in May and June, 1987 for the first cohort and in May and June, 1988, for the second. Measures included the Battelle Developmental Inventory and the Sequenced Inventory of Communication Development (SICD), in addition to the various parent questionnaires mentioned above. A parent satisfaction with treatment questionnaire and parent report of child's health was also administered at posttest. The Sequenced Inventory of Communication Development was chosen as a complementary measure because of the intervention emphasis on language development. Pretest demographic data and treatment verification data were analyzed to improve the generalizability of our data by allowing us to control for family demographic differences and differences in service delivery. The addition of the SICD at posttest was based on information provided by program staff indicating that language development was a major focus of their interventions.

Posttest #2: Second year posttest data were collected on 44 children and families in the first cohort in May and June, 1988. Prior to the second posttest, a more formal survey of program staff was conducted, and the Vineland was added due to the importance of adaptive behavior with more severely handicapped children. Measures of child functioning included the BDI, the SICD, and the Vineland, and the standard set of parent measures was again administered.

Results and Discussion

Comparability of groups on pretest measures. Pretest data from child and family measures appear in Table 4.5. There were no statistically significant pretest differences, but difference approached significance in the BDI adaptive behavior, communication, cognitive, and total score domains. These were included as covariates in posttest analyses.

Family measures indicated no statistically significant differences, but relatively large effect size differences were found in the other related and total stress scores of the PSI, and in the number of critical life events included in the FILE. Scores on the PSI, FRS, FSS, and FILE were converted to percentiles for ease of interpretation. Percentiles for the PSI and FILE were taken from standardization data, and for the FRS and FSS were derived from the EIRI pretest sample of over 600 families. These differences were used as covariates in posttest analyses of family measures.

Subject attrition. Sixteen subjects were lost for study purposes before the first posttest session, and an additional eight dropped out between the first and

Table 4.5
Comparability of Groups on Pretest Measures
for Sunshine/Richardson Treatment Intensity Study

Variable	Low Intensity				High Intensity						
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ESs	P Value
• Age in months at Pretest	28.3	(14.2)		29	28.9	(12.3)		41	.04		.85
• Battelle Developmental Inventory (BDI)[*] DQs for:											
Personal Social	49.4	(27.2)		29	55.1	(23.3)		41	.89	.23	.35
Adaptive Behavior	49.3	(25.5)		29	59.1	(25.9)		41	2.50	.38	.12
Motor	46.6	(25.8)		29	52.7	(27.1)		41	.91	.23	.34
Communication	42.1	(25.9)		29	51.4	(25.2)		41	2.28		.14
Cognitive	46.5	(24.6)		29	57.5	(27.5)		41	2.92	.42	.09
TOTAL	47.0	(24.2)		29	55.5	(24.8)		41	2.03	.35	.16
• Parenting Stress Index (PSI) Percentile Rank[+]											
Child Related (range 50 to 235)	122.8	(27.9)	90	27	120.0	(23.3)	88	39	.02	-.10	.88
Other Related (range 74 to 200)	127.4	(32.8)	61	27	134.2	(29.6)	72	39	.76	.21	.39
TOTAL (range 137 to 328)	249.1	(55.9)	79	27	258.8	(63.6)	85	39	.41	.17	.53
• Family Adaptation and Cohesion Evaluation Scales (FACES)[&]											
Adaptation (range 0 to 24)	7.7	(6.3)		29	7.9	(6.0)		39	.02	.03	.88
Cohesion (range 0 to 30)	9.8	(8.0)		29	8.2	(6.3)		39	.85	-.20	.36
TOTAL (range 1 to 54)	17.5	(12.0)		29	16.1	(8.9)		39	.30	-.12	.59
• Family Resource Scale (FRS)[@]	114.4	(22.0)	41	29	114.3	(20.1)	41	40	.002	.00	.96
• Family Index of Life Events (FILE)[+]	28.8	(11.8)	98	29	30.1	(12.2)	99	41	.19	.11	.66
• Family Support Scale (FSS)[@]	8.7	(5.0)	2	29	11.9	(8.1)	5	39	3.53	.64	.06

NOTES: [*] Statistical analyses for BDI scores were conducted using ratio Development Quotients (DQs) computed by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[†] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[+] Percentiles for the PSI and file are based on raw score averages, and the percentiles reported are taken from normative data.

second posttest. Ten of these subjects have moved with no forwarding address. One parent removed her child from the study because of displeasure with the random assignment. Two severely handicapped subjects have died as a result of medical complications. One subject was lost to the study because the program staff felt the classroom setting would better serve that child's needs. Another two children were in foster homes, and the instability of their placements necessitated discontinuance of their participation. Six parents withdrew due to dissatisfaction with their participation in the research (the demands of the testing). Attrition appears to be random, and analysis of pretest data on those who have dropped out versus those who have remained indicated no differences between those continuing and those dropping out (see Table 4.6).

Table 4.6
Attrition Data

Variable		Group								ANOVA					
		Low Intensity				High Intensity				Group		Study Status		Group by Status	
		X	(SD)	%	n	X	(SD)	%	n	F	P	F	P	F	P
• CA at Pretest	IN	27.7	14.4		26	28.0	11.8		35	.12	.73	.21	.65	.07	.79
	OUT	25.3	16.0		15	27.4	14.5		10						
• BDI Total DQ	IN	46.3	25.2		26	54.2	24.1		35	1.71	.20	.20	.66	.00	.98
	OUT	48.9	23.4		15	57.0	30.0		10						
• Total PSI	IN	244.2	53.9	75	23	259.1	47.8	85	31	.01	.90	.23	.63	.84	.18
	OUT	254.7	49.6	80	15	236.8	47.4	65	10						
• Child Related PSI	IN	120.5	28.8	85	23	121.1	22.6	85	31	.83	.36	.00	.97	.99	.32
	OUT	127.2	30.4	90	15	115.0	25.6	75	10						
• Other PSI	IN	123.7	29.4	55	23	138.0	30.4	75	31	.37	.54	.75	.39	2.00	.16
	OUT	127.5	29.8	55	15	121.8	24.9	45	10						
• Education Mother	IN	11.7	2.2		26	11.9	2.0		35	.53	.47	.20	.67	.04	.84
	OUT	11.8	2.4		14	12.3	3.2		10						
• Education Father	IN	11.9	1.4		25	12.0	2.3		34	.51	.48	.10	.75	.39	.53
	OUT	11.8	2.1		12	12.5	3.5		10						
• Income	IN	$15,981	9,825		26	$17,774	10,393		31	.67	.42	.13	.72	.02	.89
	OUT	$14,679	9,762		14	$17,167	12,657		9						

Measures of Child Functioning

Data from the BDI and SICD are presented in Table 4.7 for first posttest, and Vineland data are added for the second posttest in Table 4.8.

First Posttest. Table 4.7 contains results of posttest measures of child functioning. Battelle pretest data (in each domain) were the best predictors of Battelle posttest scores, with correlations ranging between .72 and .96. All were statistically significant at the $p < .001$ level. Regression analyses indicated that the BDI total DQ (Age Equivalent/Chronological Age) was an adequate predictor of outcome in all domains, but where pretest differences approached significance, these data were used as covariates. The pretest Battelle DQ, hours mother worked, and both parents' education were then used as covariates in an analysis of covariance (ANCOVA), with treatment groups (high intensity vs. low intensity intervention) as the independent variable and Battelle posttest DQs as dependent variables. Significant adjusted mean differences were found in the communication and cognitive domain ($p < .10$). Average communication domain DQs among the high intensity group remain higher after adjustment than those DQs among the low intensity group, but adjusted means in the cognitive domain favor the low intensity group. No statistically significant differences were found on the SICD. Scores on the SICD are reported in the table as differences between language age and chronological age, such that the larger the negative number, the further delayed the child is. The SICD is a more sensitive measure of communication skills than the BDI communication domain, especially at younger ages, in that it focuses on more specific communication criteria. In the expressive domain, for example, specific kinds of sounds and oral (tongue and lip) movements are elicited.

Second posttest. Second posttest data are now available for 44 children and families. As indicated in Table 4.8, their were no statistically significant differences between groups, after adjustment for covariates, in any BDI or Vineland

Table 4.7

Posttest Measures of Child Functioning for Alternative Intervention Groups for Sunshine: First Posttest

		Low Intensity				High Intensity						
Variable	Covariates[&]	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES[@]	P Value
Average length of intervention in months	–	15.8	(4.0)		19	15.7	(2.9)		24		-.03	.96
Age in months at posttest	–	35.9	(14.3)		29	35.8	(11.9)		41		-.01	.95
Battelle Developmental Inventory (BDI) *	1, 2											
Personal-Social		44.7	(23.2)	50.7	29	55.5	(22.0)	52.5	41	.37	.07	.54
Adaptive Behavior		52.9	(28.4)	57.0	29	57.6	(24.1)	53.5	41	.85	-.14	.36
Motor		50.0	(27.5)	53.9	29	57.3	(29.0)	53.4	41	.01	-.01	.92
Communication		41.3	(24.2)	46.2	29	58.7	(27.1)	53.9	41	3.15	.28	.08
Cognitive		53.4	(30.5)	59.1	29	57.7	(26.6)	52.0	41	3.15	-.22	.08
Total		48.7	(24.1)	52.3	29	57.1	(22.5)	53.5	41	.33	.05	.57
SICD^	3											
Receptive		-15.5	(10.5)	14.4	24	-12.7	(10.1)	13.8	30	.07	-.06	.79
Expressive		-18.0	(10.0)	16.9	24	-15.1	(11.5)	16.2	30	.09	-.06	.76

NOTES: * Statistical analysis for BDI scores were conducted using ratio Development Quotients (DQs) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Effect Size (ES) is defined here as the difference between the groups (Intense minus Low) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[&] Covariates: 1 = BDI total; 2 = mother education; 3 = communication total

^ SICD score represents the average number of months that the child's measured age of receptive and expressive speech deviates from their chronological age. Negative numbers indicate performance below age level.

Table 4.8

Posttest Measures of Child Functioning for Alternative Intervention Groups for Sunshine: Second Posttest

Variable	Covariates[&]	Low Intensity $\bar{X}$	(SD)	Adj. $\bar{X}$	n	High Intensity $\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES[@]	P Value
Average length of intervention in months	–	27.7	(4)		16	26.0	(.5)		19		-4.20	.36
Age in months at posttest	–	45.7	(16.5)		20	43.2	(12.4)		24		-.15	.58
Battelle Developmental Inventory (BDI)[*]	1, 2											
Personal-Social		50.3	(30.5)	53.9	20	57.7	(31.3)	54.1	24	.00	.00	.98
Adaptive Behavior		51.3	(32.0)	54.7	20	57.8	(26.4)	54.4	24	.00	-.01	.95
Motor		51.5	(32.3)	54.9	20	57.4	(31.2)	53.9	24	.02	-.03	.87
Communication		43.0	(27.0)	46.1	20	55.7	(28.3)	52.6	24	1.40	.23	.24
Cognitive		49.0	(31.1)	52.8	20	60.5	(37.3)	56.6	24	.30	.10	.58
Total		48.3	(27.3)	51.7	20	54.5	(36.9)	51.0	24	.02	-.02	.88
SICD[^]	3											
Receptive		-19.9	(14.1)	-18.3	18	-14.4	(15.0)	-16.1	22	.47	-.16	.49
Expressive		-21.9	(14.7)	-20.2	18	-10.6	(19.7)	-12.3	22	3.08	-.54	.08
Vineland (DQs)	1											
Communication Domain		48	(27)	.51	20	55	(27)	.52	23	.02	.04	.88
Personal		66	(38)	.68	20	65	(29)	.62	23	.76	-.16	.38
Daily Living Domain		57	(30)	.60	20	65	(26)	.58	23	.06	-.06	.81
Socialization Domain		48	(25)	.50	20	57	(25)	.54	23	.47	.16	.50
Motor Domain		53	(32)	.56	20	55	(29)	.52	23	.48	-.13	.49
Motor Domain	4	53	(32)	.55	20	55	(29)	.52	23	.25	-.09	.62

NOTES: [*] Statistical analysis for BDI scores were conducted using ratio Development Quotients (DQs) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Effect Size (ES) is defined here as the difference between the groups (High minus Low) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Low Intensive Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[&] Covariates: 1 = BDI total DQ; 2 = mother education; 3 = Battelle DQ communication total; 4 = Battelle DQ motor total

[^] SICD score represents the average number of months that the child's measured age of receptive and expressive speech deviates from their chronological age. Negative numbers indicate performance below age level.

domain. Group differences approached statistical significance in the expressive domain of the SICD, however ($F = 3.08$, $p < .10$). The effect size of .54 in this domain suggests that the difference may be educationally significant. Adjusted means in the communication domain of the BDI indicate that the high intensity group has a seven point advantage in DQ, which, though not statistically significant, supports the significance of the SICD finding. Language training is a major component of the Sunshine and Richardson programs, and is an area in which staff consider themselves particularly strong. The results of the first two years of this study tend to support that belief.

Measures of Family Functioning

Analyses of family measures indicate no statistically significant group differences, but do suggest that parents of handicapped children may be more highly stressed than those in Abidin's (1986) normative sample.

First Posttest. Posttest analyses of family functioning measures are presented in Table 4.9. Pretest scores on each measure were included as covariates for posttest scores, and other pretest variables were included as covariates as indicated in Table 4.9. No statistically significant differences were found for any of the parent measures.

Second Posttest. No statistically significant differences were found in any of the dependent parent measures at second posttest (Table 4.10). A significant difference was found, however, between groups on the Family Support Scale for mothers ($F = 8.8$, $p < .05$). Mothers in the low intensity group reported more satisfaction with sources of support than mothers in the high intensity group.

Subgroup analyses. Treatment verification data, described above, included teacher ratings of parent involvement, severity of handicap, and child health data. These data, BDI data, and data on handicapping condition were used to conduct a series of subgroup analyses.

Table 4.9
Posttest Measures of Family Functioning for Alternative Intervention Groups, Sunshine: First Posttest

		Low Intensity					High Intensity							
Variable	Covariate[∞]	$\bar{X}$	(SD)	AdjX	%ile	n	$\bar{X}$	(SD)	Adj$\bar{X}$	%ile	n	ANCOVA F	ES[Δ]	P Value
Parent Stress Index (PSI)[*]														
Child Related	1, 2	116.7	(26.6)	118.0	86	26	115.0	(23.7)	113.6	82	36	.78	-.16	.38
Other Related	1, 3	128.2	(31.2)	129.7	63	26	133.8	(27.2)	132.4	72	36	.30	.08	.58
Total	1, 4	244.9	(53.8)	247.7	76	26	248.7	(44.8)	245.9	79	36	.05	-.03	.82
Family Adaptation and Cohesion Evaluation Scales (FACES)[+]														
Adaptation Range (0 to 24)	5	8.6	(6.9)	8.7		29	7.4	(6.6)	7.3		38	.77	-.20	.38
Cohesion Range (0 to 30)	6	9.8	(6.8)	9.4		29	8.2	(6.5)	8.5		38	.37	-.13	.54
Total Range (0 to 54)	5	18.4	(9.0)	18.5		29	15.6	(9.8)	15.5		38	2.1	-.33	.15
Family Resource Scale (FRS)[$#]	7	113.4	(22.6)	114.3	40	29	117.5	(18.9)	116.7	57	34	.57	.11	.45
Family Support Scale (FSS)[$#]	8, 9	29.8	(13.8)	30.6	57	28	29.6	(13.6)	28.8	57	37	.48	-.13	.48
Family Index of Life Events (FILE)	1, 4	8.1	(6.1)	9.1	43	25	10.5	(6.9)	9.5	60	36	.08	.07	.78
Percent of income spent on reimbursed medical/ educational expenses for child	---	6.6				16	5.6				23			.73

[@] Effect Size (ES) is defined here as the difference between the groups (High minus Low) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Low Intervention Group (see Glass, 1976; Tallmadge 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[+] Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the High Intensity group performed better.

[$] Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with handicapped children).

[∞] Covariates: 1 = FILE; 2 = PSI Child; 3 = PSI Other; 4 = PSI-Total; 5 = FACES-Adaptation; 6 = FACES-Cohesion; 7 = FRS-Total; 8 = FSS-Total; 9 = mother's education.

Table 4.10

Posttest Measures of Family Functioning for Alternative Intervention Groups, Sunshine: Second Posttest

Variable	Covariate∞	Low Intensity					High Intensity					ANCOVA F	ES Δ	P Value
		$\bar{X}$	(SD)	AdjX	%ile	n	$\bar{X}$	(SD)	Adj$\bar{X}$	%ile	n			
Parent Stress Index (PSI) *														
Child Related	1, 2	114.8	(28.9)	116.5	82	19	115.9	(29.1)	114.2	85	21	.08	-.08	.78
Other Related	1, 3	126.0	(31.1)	126.5	60	19	133.5	(27.9)	132.9	72	21	.63	.20	.43
Total	1, 4	240.8	(56.1)	243.0	72	19	249.4	(48.7)	247.2	79	21	.09	.07	.76
Family Adaptation and Cohesion Evaluation Scales (FACES)+														
Adaptation Range (0 to 24)	5	9.6	(6.8)	10.0		19	9.3	(7.3)	8.9		21	.31	-.16	.58
Cohesion Range (0 to 30)	6	11.8	(8.1)	11.5		19	9.3	(7.6)	9.7		21	.62	-.22	.44
Total Range (0 to 54)	5	21.4	(12.1)	22.2		19	18.7	(13.3)	17.8		21	1.42	-.36	.24
Family Resource Scale (FRS)$#	7	116.1	(26.7)	114.5	46	19	113.8	(15.1)	115.5	41	23	.03	.04	.86
Family Support Scale (FSS) - Mother $#	8, 9	34.4	(17.0)	34.5	71	17	24.6	(9.8)	24.5	42	18	8.80	-.58	.01
Family Support Scale (FSS) - Father $#	8, 9	29.3	(14.4)	30.2	54	16	26.8	(15.6)	25.8	47	13	1.11	-.31	.30
Family Index of Life Events (FILE)	1, 4	8.2	(7.2)	8.9	43	19	10.6	(7.9)	9.8	60	23	.22	.13	.64
Percent of income spent on reimbursed medical/ educational expenses for child	---	2.7				26	4.5				37			.40

@ Effect Size (ES) is defined here as the difference between the groups (High minus Low) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Low Intervention Group (see Glass, 1976; Tallmadge 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

+ Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the High Intensity group performed better.

$ Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with handicapped children).

∞ Covariates: 1 = FILE; 2 = PSI Child; 3 = PSI Other; 4 = PSI-Total; 5 = FACES-Adaptation; 6 = FACES-Cohesion; 7 = FRS-Total; 8 = FSS-Total; 9 = mother's education.

Parent involvement. Parents who were rated at least "medium" in their involvement were selected to investigate the impact of involvement on child functioning. This group included 42 children, 14 in the low intensity and 28 in the high intensity groups. Their were no statistically significant differences between groups in the BDI, but children in this group did have higher adjusted DQs than children whose parents were not rated at least "medium" in involvement. It was also found that parents in the more involved group were more highly educated than those in the low involvement group.

Severity of handicap. Based on pretest BDI total DQs, children were divided into two groups, one of mildly delayed children (DQ $\geq$ 55) and one of moderately to severely delayed children (DQ < 55). One way ANOVAs were then conducted for each group, with BDI DQs as dependent variables and treatment group as the independent variable. No differences in either group were statistically significant, but differences in the communication domain approached significance in both groups (F = 2.03, p = .17, moderate-severe group; F = 2.89, p = .10, mild group). Additionally, treatment group differences approached significance in the child-related stress domain of the PSI among parents in the moderate to severe DQ group (F = 3.45, p = .08). Parents in the high intensity group scored in the 79th percentile, and those in the low intensity group scored in the 91st percentile. Thus, the high intensity group reported less stress than the low intensity group. Pretest PSI and FILE scores were used as covariates, such that pretest stress levels were accounted for. An effect size of -.59 suggests that this difference may be practically as well as statistically significant.

Child health data. Parents were asked at posttest to rate their child's general health over the past year as worse than, the same as, or better than, that of children of the same age. Forty-eight children were rated as at least as healthy as most children their age. A two-way analysis of covariance (ANCOVA) was conducted, with BDI DQs as dependent variables, pretest total DQ, maternal education, and hours mother worked as covariates, and treatment group and health status (worse than most or as good or better than most) as independent variables. No statistically significant interactions were found, and no differences based on health status were indicated. Group differences were the same as reported above.

Conclusions

From the perspective of service providers, results of this study may be viewed as disappointing. The data suggest that a twice-per-week home visit model is no more effective than a once-per-week program. Such a viewpoint, however, may indicate that these providers are expecting too much of themselves. In the service model used here (which is a typical model), intervention is delivered for one hour per week for the low intensity group, and two hours per week for the high intensity group. Assuming children are awake for approximately 100 hours per week (which allows 10 hours per day for sleep), this represents a maximum of 2% of the available learning time. Although one might reasonably expect a doubling of services to improve child and/or family outcomes, a change from 1% to 2% of available time is not very substantial. These children and families are on their own for the vast majority of their time.

From another perspective, the results of this study are encouraging. They suggest that if a provider can obtain sufficient financial support to expand from once to twice per week program, that expansion should focus on children who are not currently being served rather on a doubling of services to families already enrolled. Eligibility criteria could be expanded, or child find efforts increased, or some combinations of these or other efforts could be developed.

Additionally, if the differences found in communication skills continue to hold when a complete set of second-year data are available, it may be an indication that greater concentration on this area would produce yet more improvement in this domain.

Providers of home-based services should, in fact, be encouraged rather than discouraged by these data. Given the mandates of P.L. 99-457 for early intervention services, the findings reported here suggest that services can be provided to increased numbers of children and families. If, indeed, available funds allow expansion of eligibility criteria, it may be found that less severely delayed children make substantial improvements relative to their more seriously delayed peers. Such a finding would indicate that early intervention funds were well spent.

Future Plans

The Sunshine/Richardson site has currently collected data on 70 children. Efforts are being made to find additional families who were not available for the most recent testing sessions. One family has moved to Montana, and a local diagnostician will soon administer posttest measures. During the coming year, quarterly postcards will be sent to all families currently enrolled to provide updated addresses and maintain contact. Some of the children will continue to receive services from the Sunshine and Richardson Centers, such that our contacts there will be able to help us keep in touch with these families on a more regular basis. Third year posttesting will begin in May and continue through June, 1989 using the same measures as in the second posttest.

For children who have moved into center-based preschool or school programs, information sheets will be sent to teachers regarding the services provided. Data obtained from these sheets will include the number of hours per week in regular and special education classrooms, additional services provided, attendance and parent involvement data, and standardized test data. This data will be collected each year until the end of the study.

SMA/LAKE McHENRY PROJECT

Project #5

COMPARISON: Severely Handicapped Children--Once per week versus three times per week services.

LOCAL CONTACT PERSON: Dr. Alice Kusmierek, Coordinator, Interagency Project for Early Intervention.

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DATE OF REPORT: 10-7-1988

Rationale for Study

Although popular support for early intervention efforts has been strong, research on early intervention effectiveness has shed little light on important issues such as the relative effectiveness of various program intensities (White & Casto, 1985). The research base which has dealt with moderately to severely handicapped young children is particularly sparse (Bailey & Bricker, 1984). Indeed, it is only within the last 12 years, since the advent of P.L. 94-142, that children with significant impairments have been systematically included in early intervention programs (Bailey & Bricker, 1984). Very little is thus known about the optimal intensity of services to be provided to this group of children.

Review of Related Research

The implementation of P.L. 99-457, Amendments to the Education of the Handicapped Act of 1986, has focused attention on early intervention services in general and on services to infants and toddlers in particular. As states are developing plans to service the youngest population of children with handicaps, questions are being raised regarding the most appropriate types of services to be provided. Peterson (1987) has discussed seven specific decisions which must be made regarding the development of a service delivery program, including who will be the target of service (e.g. child, mother, father, both parents, family), at what age services should begin, what services should be provided, in what setting the intervention program will be provided, who will be the primary intervention agent, in what social context services will be provided (e.g. individual or group program), and which agencies will provide services.

Although certain aspects of service delivery will be determined by practical and political forces--i.e. decisions regarding the agencies through which services will be delivered will be made at a state level based on the ability of different state agencies to perform this role--decisions regarding other aspects of service delivery can be facilitated when research data on the effectiveness of various approaches are available. The availability of such data are particularly important in light of the cost issues--i.e. the cost of human as well as monetary resources-- which various approaches to service delivery entail. However, the overriding issue should be, and is, how the services which are provided to infants and toddlers can maximize their development.

Decisions regarding the type of services to be provided are particularly important, as such decisions are directly related to both the cost of intervention as well as its effectiveness. Although a myriad of research questions on the relative costs and effects of different types of services can be asked, a very basic question is, "How many hours of service should be provided each week in order to maximize child and family functioning?"

According to Bricker (1986), one hour per week of individual services is a common service delivery model for children under age three, in either a home-based or center-based setting with the child and primary caregiver present. This model has face validity from both a cost and a practical perspective--i.e. it makes sense to provide a relatively low intensity of services to young children whose skill development needs are relatively restricted as a result of their age, as well as to recognize the parent's responsibility as a caretaker first and an intervention agent second. However, given the impetus of increased funding for infant and toddler services, the question of efficacy must be raised with regard to the appropriateness of such a relatively low intensity of service. If resources are to be used to serve this population, then would an increase in the frequency with which services are provided result in greater gains in both child and family functioning?

Overview of Study

It was the purpose of the present study to address the question of the relative efficacy of different intensities of early intervention services for handicapped children under age three. The study involved an experimental comparison of the costs and effects of serving children on either a one hour per week or a three hour per week basis. Three hours per week were selected as the greater level of intensity of services based on a number of factors. First of all, even a more intensive level of service must take into account the factors of child skill development needs as well as the parent's role in intervention. While twenty hours of services per week would provide a very clear cut intensity comparison, it would not only dramatically increase the parent's role as an intervention agent, but would be difficult to justify given the types of skills and rate of skill development expected of any child under age three. The costs of providing such services on an individual basis would also be exorbitant. Three times per week for one hour each time, however, represents a level of service which is more intense than once per week, yet is not so intense that the parent's role is changed or so that expectations for child gains are exceeded. Indeed, it was hypothesized that three times per week services would not only maximize the opportunity to intervene with particular child skills, but would increase the opportunity for program staff to provide family-oriented services as specified by P.L. 99-457.

To examine the relative effectiveness of once per week versus three times per week services, a number of measures of child and family functioning were selected for use in this study. In order to assess intervention effects on the child, the Battelle Developmental Inventory (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984), Bayley Scales of Infant Development (Bayley, 1969), and the Wisconsin Behavior Rating Scale (Song & Jones, 1980) were administered. The BDI was selected in order to assess the child's overall development as well as skill development in five domains of functioning: Personal/Social, Adaptive, Motor, Communication, and Cognitive. The BDI allows for direct assessment and observation of child skills as well as use of parental report. The scale can be used with children between birth and 8 years of age, thus facilitating the assessment of children of different ages on a longitudinal basis. The Bayley Scales were selected in order to provide a more fine-grained analysis of the child's cognitive and motor skills. The Bayley Scales have also been used extensively in previous studies of early intervention, and thus thus their use would facilitate comparison of the results of this study to earlier work. The Wisconsin Behavior Rating Scale is completed by a specialist or educator who is familiar with the child, and thus allows for another source of data to be used to assess child skill development.

A battery of instruments which would allow for the assessment of the effects of intervention on the mothers and fathers of subjects was also administered. These instruments were selected in order to address criticisms of previous research in which the focus of assessment was restricted to child outcome measures (Mott, Fewell, Lewis, Meisels, Shonkoff, & Simeonsson, 1986). The instruments selected for use in this study were based on reviews of the literature on expected family outcomes, and thus included measures of parent stress, social support, resources, family functioning, and life events and changes. The specific instruments included the Parenting Stress Index (Abidin, 1983), the Family Support Scale (Dunst, Jenkins, &

Trivette, 1984), the Family Resource Scale (Dunst & Leet, 1985), the Family Adaptability and Cohesion Evaluation Scales (Olson, Portner, & Lavee, 1985), and the Family Inventory of Life Events and Changes (McCubbin, Patterson, & Wilson, 1983).

Methods

Subjects

The subjects were 60 children between four and twenty-seven months of age at pretest who were served by three different intervention programs in the Chicago suburbs. The recruitment, assignment to groups, and demographic characteristics of the subjects are described below.

Recruitment. Subjects were recruited from three intervention programs in the Chicago suburbs. The three programs--South Metropolitan Association (SMA), Lake-McHenry Regional Program (LMRP), and Southwest Cooperative Association (SW Coop)--received funding from the State of Illinois Board of Education from July 1, 1985 through June 30, 1988 to conduct an evaluation of the effectiveness of expanding services to the birth to three population. All three programs had in the past provided once per week intervention services to children under age three, and, as a requirement of their funding from the state, agreed to provide three times per week services to a randomly assigned experimental group.

Between January 1, 1986 and June 30, 1987, all children who were referred to any of these three programs were considered for inclusion in the study if they were 24 months of age or less and had either a diagnosed handicapping condition or demonstrated overall developmental delay of 65% or more. A determination of developmental delay was made through a multidisciplinary team assessment conducted by the program as well as through completion of the Wisconsin Behavior Rating Scale by the member of the team assigned as the child's case manager. The age cutoff was included to ensure that all children would have an opportunity to participate in at least one year of early intervention services before moving on to a preschool program at age three. All new referrals who met these criteria were informed of the nature of the research project by program staff and asked to participate in the study. The requirement of random assignment to groups, and the possibility of obtaining three times per week services, was emphasized. It was made clear that a decision not to participate in the study would in no way influence their ability to access the once per week services typically provided by the program.

A total of 79 children and their families agreed to participate as subjects in the study. Of these, 19 families dropped out of the research project before posttest data could be collected. The most common reason for attrition was a move out of the area (9 subjects). Other reasons included death of the subject (3 subjects), refusal to participate in posttesting (1 subject), dissatisfaction with the frequency or nature of services provided (5 subjects), or, as was the case with one subject, a change in his custody to the Division of Family Services. Attrition across groups was relatively equal (11 experimental, 8 control).

Assignment to groups. Subjects were entered into the study on a continuous basis as identified by the programs and randomly assigned to groups by the author. Data on the subject's handicapping condition and/or developmental status as provided by the program and the parent's level of stress as determined by the parent's score on the Parenting Stress Index (PSI) (Abidin, 1983) were used to stratify the subjects prior to random assignment. (A more detailed description of the procedures utilized to randomly assign subjects can be found in White, Mott, & Barnett, 1987).

Demographic characteristics. Data on the demographic characteristics of all subjects entered in the study as of June 30, 1987, as well as subjects in the experimental and control groups who participated in Year #1 posttesting, are presented in Table 5.1. The total sample can be characterized as predominantly white

Table 5.1

Comparability of Groups on Demographic Characteristics for SMA/Lake-McHenry Project

	Active Subjects Enrolled by June 1, 1987							Subjects Included in Year #1 Analyses (Based on Posttest Demographics)						
	Basic Intervention			Expanded Intervention				Basic Intervention			Expanded Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/88	15.1	(6.2)	40	13.8	(6.6)	34	.38	15.0	(6.1)	31	13.8	(6.3)	29	.46
• Age of mother in years	30.8	(5.8)	39	32.7	(5.1)	33	.07	30.3	(5.4)	31	32.7	(5.3)	28	.09
• Age of father in years	32.3	(7.8)	36	34.6	(6.9)	33	.19	31.8	(8.1)	28	34.7	(7.1)	28	.16
• Percent male *	51.2		41	65.8		38	.19	48.4%		31	62.1%		29	.30
• Years of education for mother	13.5	(1.9)	39	13.0	(1.6)	33	.24	13.7	(2.0)	31	13.3	(1.8)	29	.50
• Years of education for father	14.1	(2.1)	36	13.5	(1.9)	31	.25	14.0	(1.8)	27	13.5	(1.8)	29	.22
• Percent with both parents living at home *	66.7		39	78.9%		30	.01 *	79.8		29	93.1%		29	.13
• Percent of children who are caucasian *	80.6		36	100.0		31	NC	82.8		29	96.6%		29	.09
• Hours per week mother employed	10.8	(16.6)	39	6.9	(14.3)	32	.30	11.0	(19.0)	28	13.3	(17.8)	23	.66
• Hours per week father employed	33.8	(16.3)	34	40.9	(9.8)	29	.04 *	41.6	(10.0)	25	43.3	(7.5)	26	.51
• Percent of mothers employed as technical managerial or above *	13.2		38	25.0		32	.21	14.8		27	20.7%		29	.57
• Percent of fathers employed as technical managerial or above *	35.3		34	31.3		32	.73	44		25	34.5%		29	.48
• Total household income	$27,002	(22,068)	35	$26,959	(16,996)	32	.99	$30,342	(22,919)	28	$26,396	(17,320)	27	.48
• Percent receiving public assistance	27.3		33	21.4		28	.61	25.8%		31	13.8%		29	.25
• Percent with mother as primary caregiver *	96.9		32	96.7		30	.96	96.6%		29	100%		29	NC
• Percent of children in day care more than 5 hours per week *	10.3		29	3.8		26	.35	20.7%		27	18.5%		27	.84
• Number of siblings	1.3	(1.1)	37	1.2	(1.0)	32	.52	.94	(.81)	31	1.2	(1.0)	29	.26
• Percent with English as primary language	92.3		39	100.0		33	NC	93.5%		31	100%		29	NC

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

and middle class. Most subjects lived in two-parent households in which fathers were employed full time and mothers were the primary caretakers for the child.

Intervention Programs

The two intervention groups differed along the dimension of frequency of services, with the experimental group receiving three times per week services and the control group receiving once per week services. The specific services provided are described below.

Control group (once per week services). Children and primary caretakers in this group participated in a once per week contact with either an infant specialist (e.g. speech/language pathologist or occupational or physical therapist) or an early childhood special educator. While most contacts occurred at a center-based location, programs did allow the flexibility of conducting some of the contacts in the parent's home. As the programs did not provide transportation to the children and their parents, the most common reason for providing a home visit was parental lack of transportation to the center. However, home visits were also provided when a particular teaching session could be most effectively accomplished in the home (e.g. when feeding or sleeping behaviors were of concern).

The content of the intervention sessions was directly related to the needs of the specific child and family as specified in the child's Individualized Education Plan (IEP). No specific curriculum was followed unless the individual specialist or educator found that doing so would meet the child and family's specific needs. The specialists and educators thus has a great deal of freedom in determining what was accomplished during the individual sessions. However, in general there were program expectations that the sessions would focus on improving child development in the domains of personal/social, adaptive, motor, language, and cognitive functioning, and that the sessions would also help parents to become intervenors for their child. Another major goal of the sessions was to provide a forum for parents to discuss issues of concern to them and to help them adapt to the daily demands of caring for a handicapped child.

Experimental group (three times per week services). Children who were assigned to this group participated in three, one-hour contacts per week with a specialist or educator. The content and focus of the sessions was the same as that for the control group. It was expected, however, that the increased staff contact time would allow for a wider range of IEP goals to be addressed, and that the more frequent contact would allow more parent concerns and issues to be incorporated into the treatment sessions.

Optional intervention services. Although last year's site report presented an estimate of the number of optional services accessed by parents in both groups, an estimate for the current year cannot be provided as the programs did not formally monitor and report this information for the subjects in this study. The one exception is for the psychiatric services provided by the Lake-McHenry program as reported in the analysis of the cost data. These data indicated that the experimental and control groups received relatively equal levels of this service (an average of .87 hours for the experimental group subjects, and 1.08 hours for the subjects in the control group).

Treatment verification. A number of procedures were implemented in order to verify that treatment was implemented as intended. These data are presented in Tables 5.2.1 and 5.2.2. An examination of the attendance data indicates that the experimental group participated in a significantly higher number of intervention sessions than did the control group, thus providing support for the integrity of the experimental comparison. However, percent attendance in the control group was higher (although not statistically significant at $p \leq .05$) than for the experimental group, which indicates that rather than receiving three times as many services the experimental group received only 2.37 more services than the control group.

Table 5.2.1

Treatment Verification Data for SMA/Lake McHenry Project

	Basic Intervention Group			Expanded Intervention Group			t value	Prob.	ES
Variable	N	Mean	SD	N	Mean	SD			
1. Attendance Data									
No. of Sessions Attended	31	26.94	6.78	29	63.72	16.36	-11.24	.00*	5.42
No. of Sessions Offered	31	36.32	4.77	29	95.90	13.48	-22.52	.00*	12.49
No. of Home Visits	31	6.87	10.13	29	21.21	21.01	- 3.33	.00*	1.42
No. of Center Visits	29	42.28	15.57	29	42.28	15.57	- 6.49	.00*	2.01
Percent Attendance	29	66.76	14.80	29	66.76	14.80	1.80	.08	- .44
2. Teacher Ratings*									
Parent Attendance	31	2.52	.68	29	2.62	.56	- .65	.52	.15
Parent Knowledge	31	2.16	.69	29	2.48	.57	- 1.96	.05*	.46
Parent Support	29	2.76	.44	29	2.76	.44	- 2.34	.02*	.51
3. Rating of Intervention^									
Quality of Session	29	19.86	8.08	26	16.12	7.34	1.79	.08	- .47
Ranking of Intervenor	28	1.14	.36	26	1.19	.40	- .48	.63	.14
4. Parent Satisfaction Ratings*									
Staff	31	3.61	.76	29	3.48	.6344	.72	.47	- .17
Communication	31	3.48	.72	29	3.62	.49	- .86	.39	.19
Goals	31	3.42	.76	29	3.28	.65	.78	.44	- .18
Participation	31	3.55	.77	29	3.66	.55	- .61	.54	.14
Range of Service	31	3.42	.76	29	3.21	.82	1.04	.30	- .28
Progress	31	3.29	.74	29	3.14	.79	.77	.44	- .20
Overall/General	31	3.42	.76	29	3.28	.80	.71	.48	- .18
5. Child Health									
Number of Days Hospitalized	31	2.48	5.09	29	1.59	2.77	.86	.40	- .17
Days With 103 + Fever	31	.81	1.71	29	.38	.73	1.71	.09	- .37

*Parents were rated in three areas (i.e., attendance, knowledge, and support) by the intervenor who worked with them most closely. Rating scale was 1 = low; 2 = average; and 3 = high.

^Videotapes of a typical intervention session were scored by independent raters as to how well best practices were followed. Highest possible rating was 32.

*Participating parents rated their satisfaction with the program in seven areas on a scale of 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Table 5.2.2

Additional Services and Child Health Data for SMA/Lake McHenry Project

Variable	N	One Time Per Week Group Percentage	N	Three Times Per Week Group Percentage
1. Additional Services				
a. Speech Therapy (Average)	29		31	
None		83.9%		79.3%
<1 Hr. Week		6.5%		10.3%
1 Hr. Week		3.2%		6.9%
2 Hrs. Week		6.5%		3.4%
>2 Hrs. Week				
b. Physical or Occupational Therapy	29		31	
None		67.7%		79.3%
<1 Hr. Week		12.9%		6.9%
1 Hr. Week		9.7%		10.3%
2 Hrs. Week		6.5%		
>2 Hrs. Week		3.2%		3.4%
c. % Receiving Social Work Services		0.0%		6.9%
d. % Receiving Home Nursing Services		6.5%		17.2%
e. % Receiving Nutritional Services		3.2%		10.3%
f. % Receiving Respite Services		9.7%		3.4%
g. % Receiving Parent Services		17.2%		22.6%
2. Child Health Over Past Year	33		25	
% With Seizures		9.7%		20.7%
% With Unusual Weight Gain or Loss		9.7%		3.4%
% With Infectious Diseases		3.2%		3.4%
% With Eye/Ear Problems		58.1%		51.7%
General Health				
Worse Than Most		16.1%		24.1%
Average		71.0%		69.0%
Better Than Most		12.9%		6.9%

The specialists or educators were also asked to rate each parent's attendance, knowledge, and support for intervention efforts. These ratings suggest that parent attendance was similar across groups, but that the experimental group was significantly more knowledgeable and supportive of intervention efforts than was the control group.

Videotapes of a typical treatment session were also rated to determine the extent to which the intervention represented 'best practices'. The highest possible rating was 32. Although there was a trend in the direction of a higher quality of intervention for the control group, the difference between groups on this variable was not statistically significant ($p \leq .05$). There was also no significant difference in the ranking of intervenors by their supervisors, or in the parents' satisfaction with services.

Although additional services did not differ significantly across groups, these data do indicate that a relatively large number of the families enrolled in this study accessed additional services for their children at their own expense. The implications of this finding for the posttest analyses will be discussed in a later section of this report.

Cost of alternative interventions. Costs were estimated using the "ingredients" approach recommended by Levin (1983). This was done by developing a complete description of the alternative intervention programs, identifying all of the "ingredients" used in delivering each intervention, and using information from agency records, observation, or comparable resources to estimate the cost of each "ingredient." Table 5.3 summarizes the average cost per child for 3 days per week versus 1 day per week in the SMA and the Lake McHenry locations. These two programs were used as the basis for the calculations since they serve the majority of the children included in the project.

Table 5.3

Approximate Costs of Providing Early Intervention Services for SMA/Lake McHenry Project

	One Time Per Week Group			Three Times Per Week Group		
	SMA	Lake McHenry	Average	SMA	Lake McHenry	Average
Personnel						
Direct Service Staff	2186	1521	1854	5684	3861	4773
Secretarial & Administrative	1247	502	375	3741	1506	2624
Consultants	0	1.50	.75	0	4.50	2.25
Facilities	164	211	188	492	633	563
Equipment	41	65	53	123	195	159
Transportation	122	26	74	366	78	222
Materials & Supplies	57	93	75	171	279	225
Utilities, Insurance, & Miscellaneous	12	171	92	36	513	275
TOTAL	4119	2689	3404	10,903	7168	9035

It is interesting to note that the cost of providing services three times a week (i.e., $6,198 per child) is only 2.7 times as much as the cost of providing services only one time per week (i.e., $3,404).

It is interesting to note that the cost of providing services 3 times a week (i.e., $9,035 per child) is only 2.7 times as much as the cost of providing services only one time per week (i.e., $3,404).

Data Collection

All subjects were tested at program entry and then again after one year of intervention. Data collection procedures are described below.

Diagnosticians. Two diagnosticians were hired to complete pretesting and year one posttesting. These diagnosticians were not employed by any of the participating programs, and were not informed of the purpose of the study or of the group assignments of the subjects. They were trained to administer the measures by staff of the Early Intervention Research Institute. Scheduling of subjects and monitoring of diagnosticians was coordinated by staff of the SMA program, who also had overall responsibility for coordinating the project for the State of Illinois.

Pretest data collection. Pretesting was accomplished in two phases. The first phase of pretest data collection occurred at the time that parents consented to participate in the study. At that time, parents were asked to complete the Parenting Stress Index, and the educator or specialist assigned to the family's case was asked to complete the Wisconsin Behavior Rating Scale. These data were then used for stratification purposes during random assignment.

After the subject had been assigned to a group, the diagnostician contacted the parent and scheduled a testing session to complete the remainder of the pretest battery, which consisted of the Battelle Developmental Inventory (BDI), the Family Support Scale (FSS), Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III). Testing occurred at one of the program sites closest to the parent's home, although in some instances it was necessary to schedule testing at the home. Parents were paid $20 to participate in the approximately one and one-half hour testing session.

Although most subjects were tested within two weeks of their assignment to groups, at the time that subjects were first entered into the study (in January of 1986) plans for administering a full pretest battery had not yet been finalized by Institute staff. Therefore, some subjects were not pretested until June of 1986.

However, this delay in pretesting did not have a significant effect on the amount of time between pretest and posttest across groups (see table 5.5).

Year 1 posttesting. Posttesting was scheduled twelve months after the date upon which the subject first entered services. However, the average amount of time between pre- and posttesting was less than 12 months, due primarily to the delay in pretesting described above. The time between pre-and posttesting did not, however, differ significantly across groups.

The posttest battery consisted of a large number of child and family measures, which necessitated the scheduling of two separate testing sessions. The first session, which lasted approximately 1-3/4 to 2-1/4 hours and for which parents were paid $20, included the administration of the BDI, PSI, FILE, FRS, FSS, and FACES III. The second session, which lasted approximately 1-1/2 hours and for which parents were paid $15, included the administration of the Bayley Scales of Infant Development, Parent Survey Form, Parent Report of Child's Health, and Parent Satisfaction with Services. (A videotape of an interaction session between the child and his/her primary caregiver was also made at this time. However, analysis of these videotapes is not yet complete and thus they will not be discussed in this report).

In addition to the data collected above, each child's specialist or educator again completed the Wisconsin Behavior Rating Scale.

Year two posttesting. Subjects will be tested again two years after their initial program entry date. The procedures utilized during and results of this second year of posttesting will be described in next year's report.

Results and Discussion

Pretest comparisons

Results of comparisons of experimental and control groups on the measures collected at pretest for all subjects as well as those subjects included in Year 1 analysis are presented in Table 5.4 The p values presented in the table are based on one-way analysis of variance. An examination of these values indicates that, at pretest, the experimental and control groups were not statistically significantly different on any of the measures of child or family functioning and that attrition did not significantly affect the comparability of groups.

Table 5.4

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	Active Subjects Enrolled by June 30, 1987									Subjects Included in Year #1 Posttest										
	Basic Intervention				Expanded Intervention					Basic Intervention				Expanded Intervention						
Variable	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	P Value	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ESs	P Value
• Age in months at Pretest	15.1	(6.2)		40	13.8	(6.6)		34	.38	15.0	(6.1)		31	13.8	(6.3)		29	.57	-.20	.45
• Wisconsin Behavior Age	7.5	(6.9)		41	6.9	(6.4)		38	.69	7.4	(6.9)		31	6.4	(5.8)		29	.32	-.14	.57
• Discrepancy Score	.55	(.28)		41	.56	(.27)		38	.97	.55	(.28)		31	.55	(.26)		29	.00	.00	.99
• Battelle Developmental Inventory (BDI) DQs for:																				
Personal Social	46	(16.4)		40	58	(17.4)		35	.65	47	(16.1)		31	58	(16.8)		29	.08	.07	.78
Adaptive Behavior	53	(13.5)		40	65	(13.6)		35	.76	53	(13.3)		31	58	(13.0)		29	.13	.09	.72
Motor	46	(26.1)		40	51	(24.6)		35	.91	47	(25.0)		31	51	(23.0)		29	.00	.00	.99
Communication	46	(8.0)		40	58	(9.3)		35	.53	47	(7.9)		31	58	(9.3)		29	.25	.14	.62
Cognitive	46	(9.0)		40	58	(8.6)		35	.60	47	(9.0)		31	58	(8.3)		29	.23	.12	.63
TOTAL	53	(71)		40	65	(71)		35	.73	53	(69.2)		31	58	(67.7)		29	.07	.07	.80
• Parenting Stress Index (PSI) Percentile Rank																				
Child Related (range 47 to 235)	116.6 (79-196)	(26.6)	86	41	109.1 (61-145)	(20.6)	74	34	.19	119.9 (81-196)	(28.0)	88	31	111.1 (61-145)	(19.9)	76	29	1.94	-.31	.17
Other Related (range 54 to 270)	127.3 (71-187)	(22.5)	61	41	122.9 (61-194)	(30.3)	55	34	.47	128.4 (71-187)	(24.8)	63	31	124.8 (77-194)	(30.5)	58	29	.25	-.15	.62
TOTAL (range 101 to 505)	243.9 (152-337)	(41.4)	75	41	239.0 (132-351)	(48.6)	70	38	.64	248.3 (152-337)	(44.0)	78	31	235.9 (145-320)	(43.9)	67	29	1.18	-.28	.28
• Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Adaptation (range)	22.2 (13-36)	(5.2)		39	24.6 (13-38)	(6.2)		34	.07	22.1 (13-36)	(5.4)		30	24.6 (13-38)	(6.3)		29	2.60	.46	.11
Cohesion (range)	38.1 (16-49)	(7.8)		39	37.9 (23-48)	(7.1)		34	.90	37.4 (16-49)	(7.7)		30	38.1 (23-48)	(6.8)		29	.17	.09	.69
TOTAL (range)	60.3 (39-83)	(10.9)		39	62.5 (44-85)	(10.9)		34	.39	59.4 (39-83)	(11.1)		30	62.7 (45-85)	(10.9)		29	1.30	.30	.26
Discrepancy	11.2	(10.4)		39	9.7	(11.5)		33	.57	10.7	(10.4)		30	8.8	(11.2)		28	.47	-.18	.50
• Family Resource Scale (FRS)Δ**	117.4	(24.5)	48	38	120.0	(16.0)	54	31	.61	120.1	(25.7)	54	29	118.0	(15.7)	50	27	.13	-.08	.71
• Family Index of Life Events (FILE) Δ**	30.2	(12.4)	57	39	28.8	(10.2)	54	34	.62	30.5	(12.9)	63	30	27.7	(9.4)	50	29	.91	-.22	.34
• Family Support Scale (FSS)	11.5	(7.8)	29	39	12.3	(7.3)	29	34	.63	10.9	(8.1)	34	30	12.6	(6.0)	24	29	.75	.21	.39

** Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Δ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

Posttest Analyses

Results of the group comparisons on the posttest measures are presented in Table 5.5. The p values in this table are based on analysis of covariance (using relevant pretest scores as covariates) for the BDI, Wisconsin, PSI, FSS, FRS, FACES III, and FILE. P values for the Bayley scores were based on oneway analysis of variance

Analysis of the data for the three measures of child functioning--BDI, Wisconsin, and Bayley Scales--indicated that the groups did not differ significantly after one year of intervention. Indeed, none of the p values even approached significance on any of these measures.

Group differences were, however, found on the measures of family functioning. On the Family Support Scale, the mother's total score for adequacy of support was higher (p=.03) for the mothers in the experimental group than for those in the control group. This indicates that mothers who participated in services three times per week reported higher levels of helpfulness for available sources of support than did mothers who participated in services once per week.

Although the differences were not significant at the .05 level or less, there were trends which favored the experimental group on the FRS. On the FRS, mothers in the experimental group reported a more sufficient level of resources in general (p=.12) and physical resources (p=.10) in particular. There was one comparison which indicated a trent toward a more favorable outcome for the control group. The mean discrepancy score for FACES III, which represents the difference between the mothers' ideal conception of family functioning versus her perceived conception of current family functioning, indicated a trend toward a larger discrepancy between ideal and perceived functioning for the experimental group (p=.18). That is, mothers in the control group tended to report a better correspondence between ideal and perceived family functioning than did mothers in the experimental group.

Table 5.5

Year #1 Posttest for SMA/Lake-McHenry Project

Variable	Covariates	Basic Intervention Group				Expanded Intervention Group				ANCOVA F	ES*	P Value
		X̄	(SD)	%ile	n	X̄	(SD)	%ile	n			
Chronological Age at Posttest	–	25.1	(6.3)		31	24.2	(7.3)		29	1.50	-.14	.23
No. of Months Between Pre- and Posttest	–	10.7	(1.8)		31	10.4	(2.6)		29			.65
Battelle Developmental Inventory (BDI) Raw Scores *	1, 2	Adj. X̄										
Personal-Social		56.0	(26.1)		31	54.0	(23.1)		29	.90	-.12	.35
Adaptive Behavior		56.0	(17.3)		31	58.0	(14.5)		29	.02	-.01	.89
Motor		52.0	(31.2)		31	50.0	(26.6)		29	.53	-.08	.47
Communication		56.0	(13.3)		31	58.0	(11.8)		29	.08	.06	.78
Cognitive		64.0	(12.4)		31	66.0	(9.6)		29	.01	-.01	.92
Total		60.0	(97.9)		31	58.0	(81.6)		29	.46	-.07	.50
Bayley Scales Raw Scores	3											
Mental Scale		104.3	(51.9)		31	112.5	(38.3)		29	.48	.16	.49
Motor Scale		46.5	(22.6)		31	47.2			29	.02	.03	.90
Parenting Stress Index	3											
Total Score		242.3	(40.5)	73	31	247.4	(53.0)	78	29	.41	-.13	.52
Child Domain		116.6	(20.6)	86	31	113.7	(22.8)	80	29	.48	.14	.49
Parent Domain		126.6	(26.5)	61	31	132.4	(35.5)	70	29	1.08	-.22	.30
Family Support Scale	3											
Total Score - Mother		26.3	(10.2)	45	30	30.7	(10.4)	63	29	5.03	.43	.03**
Family Resource Scale	3											
Total Score		117.2	(23.8)	48	29	123.2	(15.1)	60	27	2.50	.25	.12
General Resources		77.6	(14.6)		29	79.9	(10.1)		27	1.35	.16	.25
Time Availability		38.3	(11.4)		29	40.9	(9.4)		27	1.20	.23	.28
Physical Resources		30.9	(5.5)		29	32.1	(3.2)		27	2.84	.22	.10
External Support		23.6	(5.9)		29	24.5	(3.8)		27	.55	.15	.46
FACES III	3											
Discrepancy Score		8.7	(8.7)		29	11.6	(8.9)		28	1.83	-.33	.18
FILE*		11.0	(6.2)	34	30	11.0	(6.7)	34	29	.13	.00	.72
Wisconsin	3											
Deviation Score		.60	(.37)		31	.68	(.33)		29	1.40	.22	.24
Behavior Age		16.8	(10.6)		31	15.7	(9.5)		29	.60	-.10	.44

*On those variables in which higher scores indicated more favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Control Group from the mean of the Experimental Group and dividing by the mean of the Control Group. On those variables in which higher scores indicated less favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Experimental Group from the mean of the Control Group and dividing by the mean of the Control Group.

Subgroup Analyses

In order to examine the relative effectiveness of once per week versus three times per week services with a more homogeneous subsample of children with overall delays, children whose primary handicapping condition was either a speech/language or motor delay (i.e., children whose cognitive functioning was not impaired) were excluded from the analysis of the posttest data. The results of this subgroup analysis are presented in Table 5.6. An examination of these data indicates that, with a more homogenous sample, there were no statistically significant differences between the groups on any measures of child or family functioning. Although there was a trend favoring the experimental group on the family support scale (p=.12), the trends toward higher resources which were observed in the full group analyses were not present. There was also a trend in the control group toward more positive scores on the parent domain of the Parenting Stress Index (p=.13), thus suggesting that those parents who brought their children to services once per week experienced less personal stress than did those parents who participated in services three times per week.

Conclusions

Although the data have not yet been fully analyzed, a few tentative conclusions can be made about the relative effectiveness of once per week versus three times per week services. First of all, it does not appear that increasing the number of service hours to three times a week has a significant effect on the handicapped child's skill development. Although there were three separate indices of the child's developmental level, there were no significant differences between the once per week and three times per week groups on any of these measures.

Although the interventions did not appear to differentially affect child skill development, there were indications that the three time per week intervention had positive effects on family functioning. The higher score for mothers' reported

Table 5.6

Year #1 Posttest for SMA/Lake-McHenry Project
(Excluding Subjects with Speech/Language and Motor Impairments)

		Basic Intervention Group				Expanded Intervention Group						
Variable	Covariates	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANCOVA F	ES*	P Value
Chronological Age at Posttest	–	24.1	(6.1)		27	23.7	(6.8)		24	.24	-.07	.63
No. of Months Between Pre- and Posttest	–	10.6	(1.9)		27	11.0	(1.9)		24	.60	.21	.44
Battelle Developmental Inventory (BDI) Raw Scores *	1, 2	Adj. $\bar{X}$										
Personal-Social		50.0	(23.0)		27	46.0	(16.3)		24	.25	-.08	.62
Adaptive Behavior		50.0	(16.0)		27	55.0	(11.4)		24	.07	.04	.80
Motor		46.0	(30.1)		27	42.0	(23.6)		24	.19	-.06	.66
Communication		50.0	(11.2)		27	51.0	(7.8)		24	.29	.04	.59
Cognitive		50.0	(11.1)		27	55.0	(6.7)		24	.16	.05	.69
Total		54.0	(88.7)		27	51.0	(61.0)		24	.01	-.01	.91
Bayley Scales Raw Scores	3											
Mental Scale		96.2	(50.7)		27	104.4	(36.4)		24	.44	.16	.51
Motor Scale		42.9	(21.8)		27	42.8	(15.7)		24	.00	-.00	.98
Parenting Stress Index	3											
Total Score		248.3	(41.0)	78	27	256.4	(50.8)	84	24	.94	.20	.34
Child Domain		120.5	(20.3)	89	27	117.5	(20.6)	87	24	.44	.15	.51
Parent Domain		128.7	(27.8)	65	27	137.7	(35.9)	76	24	2.35	-.32	.13
Family Support Scale	3											
Total Score - Mother		26.2	(10.4)	45	27	29.5	(10.6)	57	24	2.45	.32	.12
Family Resource Scale	3											
Total Score		116.0	(25.0)	46	27	121.2	(16.0)	55	24	1.37	.21	.25
General Resources		77.5	(15.1)		27	79.4	(11.0)		24	.71	.13	.41
Time Availability		37.4	(11.8)		27	39.5	(9.7)		24	.61	.18	.44
Physical Resources		31.1	(5.6)		27	31.8	(3.4)		24	.79	.13	.38
External Support		23.2	(6.3)		27	23.9	(3.8)		24	.26	.11	.62
FACES III	3											
Discrepancy Score		9.8	(8.9)		26	11.8	(8.6)		24	.84	-.22	.37
FILE*		11.8	(6.5)	29	27	11.7	(6.3)	29	24	.00	.02	.94
Wisconsin	3											
Deviation Score		.52	(.34)		27	.61	(.31)		24	1.36	.26	.25
Behavior Age		13.3	(9.3)		27	14.3	(7.1)		24	.35	.12	.56

*On those variables in which higher scores indicated more favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Control Group from the mean of the Experimental Group and dividing by the mean of the Control Group. On those variables in which higher scores indicated less favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Experimental Group from the mean of the Control Group and dividing by the mean of the Control Group.

satisfaction with sources of support lends credence to the assumption that three times per week services allow for an increase in the amount of family support which programs can provide. The trends toward greater sufficiency of resources reported by mothers in the experimental group again support the hypothesis that an increased frequency of services allow more family needs to be met.

It is interesting to note, however, that there was a trend for mothers in the experimental group to find a greater discrepancy between their current family structure and what they perceive to be an ideal family structure than for mothers in the control group. One possible explanation for this finding is that, as programs help parents to identify and to meet more of the needs, the discrepancy between the family's current level of functioning and their ideal level of functioning becomes more obvious and pronounced. This hypothesis is supported by the observed trend, based on the subgroup analysis, for mother's in the experimental group to report higher levels of personal stress than did those mothers in the control group.

Although the results of this study do not provide support for increasing service hours for purposes of improving child functioning, the observed effects of the increased level of services on family functioning must be considered. Based on the relatively weak effects of family functioning after one year of intervention, it might appear that the significant increase in the cost of providing three times per week services versus once per week services may not be warranted. However, one hypothesis which might be presented is that the observed effects on parental support and resources might generalize to more profound outcomes such as a maintenance of parental marital status and willingness of the family to continue to maintain the child in the home. The longitudinal data to be collected in future years will be crucial in addressing these issues.

Future Plans

During the 1988-89 school year, subjects who had been receiving services and who had not yet graduated into a preschool program will continue to be served through their infant program. There are 15 children who are continuing to receive three-times-per-week services and 12 children who will continue to receive once-per-week services. Twenty-five children have turned three and are being served in preschool programs. Thus, there are a total of 52 children who will continue in the research project during the 88-89 school year and these subjects will continue to participate in yearly posttesting. The specific year-three posttest battery, however, has not been determined.

PHOENIX CHILDREN'S HOSPITAL

Projects #6 and #11

COMPARISON: Brain Injured Children--Project #6: Medical follow-up only versus medical follow-up plus home intervention. Project #11: Medical follow-up plus delayed intervention versus medical follow-up plus immediate intervention

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Rationale for the Study

Although a great deal of time and resources have been utilized to develop intervention programs for preschoolers who are discharged from neonatal intensive care units (NICUs, in which care is provided to newborns with medical problems), relatively little attention has been paid to those discharged from pediatric intensive care units (PICUs, in which children with serious illnesses and/or injuries are treated). This is true despite the fact that over the last 20 years, PICUs have impacted positively in the acute care of children with life-threatening problems. These problems follow from a wide variety of diseases and injuries, such as multiple trauma, near-drowning, and severe meningitis. The relative sparsity of attempts to follow children who have been discharged from PICUs or to provide them with appropriate early intervention services means that little data exist regarding outcomes among these children or the influence that intervention may have on their development. This study is designed to address these issues.

Review of Related Research

With respect to victims of traumatic injury in particular, Levin, Benton, and Grossman (1982) have pointed out that the notion that "children are relatively impervious to cognitive impairments after such injury is clearly not supported by the available data" (p. 207). Although there is considerable variability with respect to areas of later deficit in the drowning and meningitis groups, it is clear that loss of function frequently continues long after the initial insult. Several studies (Bruce, 1983; Bresman, 1983; Herson, 1977), have provided evidence that children between the ages of 0-3 years with head trauma, severe meningitis, and near-drowning episodes had the worst outcomes when compared to all children admitted to PICUs. The relative lack of research attention paid to these children was alarming, especially considering the number of children and the severity of the problems involved. Available research related to each type of brain injury (i.e. trauma, meningitis, and near-drowning) is reported below.

Accidental trauma is the leading cause of death in children in the United States. Investigations of the outcomes of children surviving head trauma have shown that they have persistent and marked developmental decline following severe injury (Brink,1980; Levine, 1983). Moreover, the 0-3 age group has shown a greater vulnerability than older children. In follow-up studies, only 5% of preschool children who have sustained severe head trauma are shown to be performing within normal limits by the time they enter school (Gerrins, 1976).

Similar findings among survivors of cerebral infections (including all severe infections of the central nervous system, of which meningitis is the most common), have been reported. Impairments include memory and motor difficulties, behavioral disturbances (Molnar & Perrin, 1983), and language delays. Less subtle abnormalities also occur, including neuromuscular dysfunction (spastic hemiparesis, ataxia, dyskinesia) and sensory deficits (impairments of position sense, hearing impairments, visual impairments, etc.). Problems such as seizure disorders, gastroesophageal reflux and endocrinological aberrations also need to be addressed in the rehabilitation process. Other deficiencies range from personality changes to physical disabilities and require long-term intervention (Heiskanen & Kaske, 1974).

Finally, with improved management of near-drowning patients in PICUs, there is an increasing concern that survivors will manifest neurological disabilities at some later point (Oakes, 1983). Results of one study indicated that children surviving warm water near-drowning episodes (such as those in swimming pools) had worse prognoses than those who were immersed in cold water (Frates, 1981). It was also shown that children admitted with a Glascow Coma Score (GSC) of three invariably displayed severe neurological sequelae. (The GSC is a measure of neurological functions of children who are comatose; the minimum score is 3, and the maximum is 15.) Fifty percent of those achieving a GSC of between 1-5 displayed similar problems. Children scoring greater than 5 recovered normal neurological functioning, although less obvious outcomes such as learning difficulties have not been investigated.

Although the majority of children discharged from the PICU at Phoenix Children's Hospital following the types of injury described above exhibit moderate to severe delays which might be ameliorated by well-coordinated early intervention services, few such services are currently available for children under three. Furthermore, almost none of this population access what services do exist at present.

Thus, the concept of coordinated medical follow-up and early intervention services, which is well established and widely practiced for children discharged from NICUs is worthy of investigation with those discharged from PICUs.

The question of whether coordinated medical follow up alone will result in levels of recovery similar to those obtained by children receiving more comprehensive services has not been addressed. The neglect of such intervention and study is alarming in light of the fact that a much higher percentage of the children from PICUs will exhibit delays and disabilities than those from NICUs.

Additionally, there are increasingly frequent questions about the cost-effectiveness of various types and intensities of early intervention services per se. Legislators, policy makers, and practitioners demand better information about what type of early intervention program is most likely to be successful, at what age it should start, and how it should be provided. This study will begin to address these issues for victims of severe trauma, near drowning, and severe meningitis.

Finally, as indicated above, some have suggested that "plasticity" in the early years of development may allow for recovery of functioning in the absence of intervention with brain injured children (see Levin, Benton, & Grossman, 1982). This concept may be interpreted to indicate that children do not need anything more than medical follow-up, or that children who receive intervention after a recovery period of some time may be better prepared to benefit from that intervention than children who receive immediate intervention services. The investigation reported here focuses on three groups of children: those who receive medical follow-up only, those for whom an educational intervention is delayed for one year, and others who receive immediate educational intervention.

Overview of the Study

This study is an investigation of the relative benefits and costs of three levels of service delivery to children with brain injury. One group is receiving coordinated medical follow-up from a developmental pediatrician. This follow-up consists of a visit with the pediatrician immediately after discharge and at six-month intervals thereafter. A second group receives medical follow-up plus a family-focused, home-based intervention program, both of which begin immediately after discharge. The third group is provided with medical follow-up for the first year, with home intervention added one year after hospital discharge.

The services that are being provided are in addition to those typically provided to children discharged from the PICU at Phoenix Children's Hospital. Prior to the start of this study, children and parents met with a variety of medical specialists, with little coordination of efforts. Even the minimal intervention group in this study will receive standard services plus medical coordination by a developmental pediatrician. Home visits for the two higher intensity service groups are in keeping with best practices as defined by Bricker (1986) and in keeping with the intent of P.L. 99-457. That is, most families receive home visits of about one-hour on a weekly basis. Allowances are made, however, for more or less frequent visits based on child and family needs as determined in the development of an Individualized Family Service Plan (IFSP).

Data are being collected with a variety of measures of child and family functioning, and cost data are being maintained in order to assess the cost-effectiveness of the three strategies. Pretest data on 23 subjects are currently available and are reported below.

Methods

The design of this study allows comparison of three intervention approaches, each of which represents an expansion of services typically provided to children discharged from the PICU at Phoenix Children's Hospital. By following the progress of these children and their families over several years, a foundation will be laid upon which future research should be conducted.

Subjects

Children discharged from the PICU at Phoenix Children's Hospital, and their families, who meet study criteria for type and severity of injury, are invited to participate in this study. Specific criteria for enrollment and a description of the current sample are presented below.

Recruitment. Children participating in this project are 0 to 3 year old victims of severe trauma, near drowning, or severe meningitis who live within a 50 mile radius of Phoenix. Severe trauma is defined as a score of 20 or more on the Modified Trauma Index (MTI), a measure of the child's functioning in several areas of physical response (e.g. state of consciousness, response to painful stimuli) that is taken at three times: the scene of the injury, the emergency, and at arrival in the PICU. Ratings of 20 or more at all sites are required for eligibility. Near drowning victims must have a Glasgow Coma Scale (similar to the MTI) score of 8 or less at some time during hospitalization. Selection of a GSC rating of 8 for participation in this study was made with the intent of investigating more subtle changes in neurological functioning. Severe meningitis is determined by factors such as length of illness prior to hospitalization and length and degree of child's fever, and no child is admitted to the PICU unless the condition is considered severe. Over the next 12 to 18 months, a total of 75 children and their families will be enrolled in the project, with 25 children per treatment group. Enrollment began during the last week of April, 1987.

Assignment to Groups. To date, twenty-three children have been identified who meet these criteria and whose parents have signed consent forms. One additional subject had been identified, but died at home before any pretest data were collected. Seven of the subjects are trauma victims, seven are near drowning victims, and nine are meningitis victims.

Children in these studies are classified by injury group and medical condition at discharge (see below) prior to treatment group assignment. The treatment groups are designated as follows: Group 1, medical follow-up only; Group 2, medical follow-up plus delayed home intervention; and Group 3, medical follow-up plus immediate intervention. Assignment to groups was based on the roll of a die that established the order of group assignment for the next three children in that injury category (severe trauma, near drowning, & meningitis; see the 1987 Annual Report for a complete description of assignment procedures).

Attrition. Seven children, excluding the 23 above, who had been identified and assigned to groups have left the study, two of whom are deceased. Three moved prior to pretesting and have not been located, one decided not to participate because the child seemed to be doing well and the family wanted to forget the accident, and one was discovered to have cancer, which would have confounded the impact of the injury on both the child and the family.

Demographic characteristics. Demographic characteristics of study participants are presented in Table 6.1. Probability values for between group differences were determined using a one-way analysis of variance (ANOVA). As the table indicates, differences approached statistical significance in the areas of percent of two parent families, percent of mothers with technical/managerial jobs, total household income, and percent with english as a primary language. The small size of the groups at this point, however, limits the power of statistical analyses and opens the possibility that large differences may occur due to the pure chance of random assignment. Overall, parents involved in the study to date are approximately 30 years old, on average, with one to two years of college education and an average income of about $20,000. Approximately 75% are Caucasian and about 70% are two parent families, with mothers as the primary caregiver in 90% of the cases. Fathers in approximately 40% of the families hold technical/managerial or higher occupations, and work an average of 40 hours per week. Children in the study, approximately 40% of whom are male, are an average of 29 months old and most have at least one sibling.

Intervention Programs

Intervention services are being provided by a developmental pediatrician at Phoenix Children's Hospital, and home-intervention services are provided by early childhood staff at Southwest Human Development, the largest non-profit provider of social services in the Phoenix area. The developmental pediatrician and staff at Southwest have been working together for several years.

Table 6.1

Comparability of Groups on Demographics Characteristics for Phoenix

Variable	Medical Only $\bar{X}$	Medical Only (SD)	Medical Only n	Delayed Intervention $\bar{X}$	Delayed Intervention (SD)	Delayed Intervention n	Immediate Intervention $\bar{X}$	Immediate Intervention (SD)	Immediate Intervention n	F	P
• Age of child in months as of 7/1/88	32.1	(8.4)	7	28.2	(14.8)	8	28.0	(11.6)	8	.27	.76
• Age of mother in years	28.1	(6.6)	7	31.0	(5.9)	8	30.3	(5.5)	8	.45	.63
• Age of father in years	32.2	(8.3)	6	35.6	(6.6)	7	33.0	(5.5)	8	.47	.64
• Percent male*	57.0		7	50.0		8	62.0		8	.11	.89
• Years of education for mother	13.0	(1.2)	7	12.8	(2.7)	8	14.0	(2.2)	8	.74	.48
• Years of education for father	14.4	(1.1)	5	13.3	(3.8)	7	14.6	(2.7)	8	.44	.65
• Percent with both parents living at home	57.0		7	100.0		8	87.0		8	2.70	.08
• Percent of children who are Caucasian*	71.0		7	75.0		8	87.0		8	.28	.75
• Hours per week mother employed	17.1	(21.3)	7	11.0	(16.5)	8	9.7	(16.4)	8	.34	.70
• Hours per week father employed	39.0	(2.2)	5	39.9	(30.2)	7	52.0	(22.0)	7	.66	.53
• Percent of mothers employed as technical managerial or above*	14.0		7	37.0		8	0.0		8	2.09	.14
• Percent of fathers employed as technical managerial or above*	20.0		5	43.0		7	57.0		7	.76	.48
• Total household income+	$28,285	(22,440)	7	$19,000	(16,316)	8	$42,125	(21,688)	8	2.64	.09
• Percent receiving public assistance	28.5		7	50.0		8	12.5		8	1.31	.29
• Percent with mother as primary caregiver*	85.7		7	100.0		8	100.0		8	1.15	.33
• Percent of children in day care more than 5 hours per week*	42.8		7	25.0		8	12.5		8	.84	.44
• Number of siblings	1.0	(1.2)	7	2.8	(2.5)	8	1.6	(1.5)	8	1.85	.18
• Percent with English as primary language	71.4		7	100.0		8	100.0		8	2.70	.08

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those children or families not possessing the trait were scored "0."

+ Means and standard deviations for this variable were estimated from categorical data based on procedures recommended by Hopkins and Glass (1977).

Medical follow-up only group. Children and families in this group receive medical follow-up services from the developmental pediatrician two weeks after hospital discharge and each six months thereafter. Prior to meeting with the families, information on the child's current condition and physician recommendations are gathered from the medical records and from direct interviews with each of the physicians who have treated the child. When meeting with the families, the developmental pediatrician reviews these data, assesses the families' understanding of them, and clarifies any misconceptions and areas that are not understood. Finally, he answers any questions family members have concerning the child's condition or any treatments the child is receiving. He may also provide service referral information at this time, should a family member request such information.

Immediate intervention group. Children and families in this group receive the same medical follow-up services described above plus the following home intervention package. The intervention program is based on the F.A.M.I.L.I.E.S. model developed at the University of North Carolina Research Institute. The model draws from family systems theory to reflect an individualized approach to working with children and their families. Intervention is guided by comprehensive, systematic assessment information used to specify objectives and develop an appropriate service plan. For home-based services, parents are trained to be effective teachers of their at-risk or developmentally delayed child.

The first objective of the home intervention program is the development of an Individualized Family Services Plan (IFSP). Home interveners assesses the child's current functioning, learning, and environmental and social interaction patterns. The Early Intervention Development Profile (EIDP), a criterion based assessment and curriculum package, is the primary measure of child functioning for intervention purposes. Family strengths, resources, and needs, as well as parent-child interaction patterns, are also assessed at this time. Based on results of these data, the project's pretest measures, and extensive family input, the IFSP is completed. Parents are encouraged to attend support group meetings, which are conducted in conjunction with the Pilot Parents Program in Phoenix.

Components of the IFSP include: a) play and learning objectives in the areas of self-help, fine and gross motor, communication, cognition, and social skills; b) activities to build on family strengths and to meet family needs; c) a listing of barriers preventing effective acquisition of services for the child and family; d) a listing of family concerns regarding the child's medical condition and procedures to address these concerns; and e) specification of the pattern and schedule (frequency) of continuing home intervenor visits.

A typical home visit proceeds as follows:

9:00-9:15	Warm up and casual observation of parent-child interactions.
9:15-9:30	Review of needs noted at prior meeting and development/revision of the IFSP.
9:30-10:00	Demonstration of strategies to be used by parents in developing and assessing child skills, focusing on parent-child interaction patterns.
10:00-10:30	Intervention specialist provides feedback on parent performance. Ongoing and newly identified service needs are reviewed. Intervention log is updated.

Learning activities are developed based on the EIDP assessment and developmental curriculum. Additionally, activities developed for specific medical/ developmental needs of children will be integrated in the individualized home-based treatment program for each child and family. Supervision and coordination of home intervention programs are being provided by the Intervention Services Coordinator at Soutwest Human Development.

Delayed intervention group. Children and families in this group will receive all services mentioned above, including initial medical follow-up and home intervention beginning one year after the child is discharged from the hospital.

Optional intervention services. Additional services may be recommended, and include such things as speech therapy, occupational and physical therapy, consultation with a home nurse, individual and/or family counseling, and day care/respite services. The extent to which parents participate in these services, as well as the type of services received, is monitored by the home visitor and by parent completion of the Additional Services form at posttest.

Treatment verification. A number of procedures are being used to verify that treatment is being implemented as intended. They include:

1. Collection of compliance data. Participation in the program is recorded with respect to the number of physician and home visit appointments kept and missed. Also recorded are home intervenor ratings of parent understanding and implementation of the child and family program.

2. Parent report of time. Twice each year, parents are asked by the interventionist to estimate the amount time they spend per week with the child performing activities that were recommended by program staff.

3. Home intervenor evaluations. Home intervenors are evaluated by the early intervention coordinator at Southwest Human Development with respect to performance in child and family evaluations and their teaching/intervention skills with both the child and the family.

4. Site Review. A formal site review is conducted annually. The purpose of this review is to assess the extent to which project personnel are delivering interventions as intended, the extent to which group treatment differences are being maintained, and to identify program strengths and areas in which technical assistance would enhance service delivery.

A preliminary site review was conducted before the start of home-based intervention services. The review indicated that procedures were in place for identifying and recruiting subjects, that staff were well-qualified for their roles, and that plans for home intervention were consistent with best practices.

Data Collection

Data are collected on all participants after signed consent has been obtained and annually thereafter. Data collection will continue in this manner until 1990.

Recruitment, training, and monitoring of diagnosticians. Two local diagnosticians are trained to administer the standard pretest and posttest measures, one of whom is a Ph.D. candidate and the other holds a master's degree. Testing is scheduled by the diagnosticians in coordination with an assessment supervisor, who shadow scores 10% of all test administrations for each diagnostician. A psychologist in private practive was identified who was willing to attend a training session and serve as assessment coordinator for this project. Then professors at local universities and professionals in local social service agencies were asked if they or others they knew were willing to do testing for us. Several graduate students were recommended, two of whom were selected for training. These individuals were expected to view videotapes of administration procedures for the Battelle Developmental Inventory (BDI), review the BDI administration manual, and complete a self-test of BDI procedures before attending a two-day training session. The training session addressed all facets of the BDI, and included a competency test. Finally, persons who completed the training completed three practice tests, one of which was both shadow scored and videotaped by the assessment coordinator. The videotape was sent to EIRI for review, and an interrater agreement of .80 was required before certification as a diagnostician. The coordinator also shadow scores 10% of all BDI administrations.

Pretest. The pretest battery consists of the Battelle Developmental Inventory (BDI), the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events (FILE), the Family Adaptability and

Cohesion Evaluation Scales (FACES), and a parent survey developed by EIRI staff to gather demographic data. These measures are administered within four weeks of assignment to groups. Testing is conducted by a trained diagnostician who is unaware of the child's group assignment. Administration of the BDI is conducted in a testing room provided by Southwest Human Development unless the child is medically fragile, in which case testing is conducted in the child's home. Mothers complete the family measures following administration of the BDI, and fathers (when possible) complete the Family Support Scale only. If the father or other adult is present in the home full time but is not at the testing session, the parent is given a copy of the Family Support Scale to take home for him/her to complete. The diagnostician completes a testing report and transmits all data to the assessment supervisor, who checks the scoring accuracy, copies all protocols, and transmits the originals to EIRI via certified mail.

Posttest #1. Posttesting occurs 12 months after pretesting for all participants, and is administered by the same set of naive diagnosticians, but not necessarily the same diagnostician, who administered the pretests. In addition to the instruments used at pretest, mothers complete the Parent Survey Form, the Parent Report of Child's Health, the Additional Services Form, and the Parent Satisfaction with Services Form. Parents are paid a $10 per hour incentive for testing.

Status of Posttesting. First posttesting has occurred for only two subjects because the project did not begin enrolling subjects until May, 1987. Thus no analyses of posttest data have been conducted.

Results and Discussion

Comparability of Groups on Pretest Measures

Pretest data are presented in Table 6.2, and indicate that the groups are not statistically significantly different. Probability values in Table 6.2 were derived

Table 6.2

Comparability of Groups on Pretest Measures for Phoenix

Variable	Medical Follow-Up Only				Delayed Intervention				Immediate Intervention				ANOVA F	P Value
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n		
• Age in months at Pretest	24	(7.9)		7	21.1	(13.4)		8	21.6	(10.9)		8	.13	.87
• Battelle Developmental Inventory (BDI)* DQs for:														
Personal Social	71.1	(46.8)		7	59.5	(47.5)		8	75.1	(37.8)		8	.26	.76
Adaptive Behavior	64.2	(42.1)		7	59.6	(51.3)		8	79.2	(40.2)		8	.41	.66
Motor	72.8	(45.3)		7	63.6	(41.7)		8	65.3	(47.6)		8	.08	.91
Communication	59.5	(42.6)		7	50.4	(49.9)		8	62.0	(39.7)		8	.15	.86
Cognitive	55.2	(39.1)		7	61.3	(44.8)		8	76.6	(40.8)		8	.53	.59
TOTAL	67.8	(43.2)		7	61.9	(45.4)		8	75.1	(39.1)		8	.19	.82
• Parenting Stress Index (PSI) Percentile Rank+														
Child Related	101.0	(11.4)	57	7	110.8	(18.9)	76	8	86.8	(29.1)	25	8	2.5	.10
Other Related	107.0	(21.2)	25	7	128.3	(25.3)	63	8	116.3	(12.4)	41	8	2.0	.15
TOTAL	208.0	(31.5)	35	7	239.0	(39.9)	70	8	211.8	(19.7)	38	8	2.2	.13
• Family Adaptation and Cohesion Evaluation Scales (FACES)&														
Adaptation (range 0 to 24)	8.2	(5.7)		7	8.2	(5.1)		8	6.0	(4.6)		7	.45	.64
Cohesion (range 0 to 30)	9.7	(4.4)		7	12.5	(6.2)		8	8.0	(6.9)		7	1.00	.36
TOTAL (range 0 to 54)	18.0	(7.3)		7	20.7	(6.1)		8	14.0	(8.0)		7	1.60	.21
• Family Resource Scale (FRS)@	129.4	(19.5)	69	7	116.8	(17.3)	48	8	127.8	(12.9)	68	8	1.29	.29
• Family Index of Life Events (FILE)@	11.4	(4.0)	60	7	16.4	(7.3)	83	8	10.2	(7.9)	54	8	1.80	.18
• Family Support Scale (FSS)@	27.3	(7.8)	47	7	26.5	(13.5)	47	8	26.3	(8.6)	45	8	.01	.98

NOTES: * Statistical analyses for BDI scores were conducted using ratio Development Quotients (DQs) computed by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

& Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

+ PSI scores were converted to percentile ranks based on normative data provided by Abidin (1986).

@ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

from one-way analyses of variance (ANOVAs). The differences in child functioning (BDI data) and parent stress levels show a trend toward lower functioning in children and higher stress in families in the delayed intervention group, but the small number of subjects restricts the meaningfulness of these differences. As the study progresses and more children and families are assigned to groups, the random assignment procedure described above is likely to reduce the size of these pretest differences such that they are neither statistically nor educationally significant.

Future Plans

Over the next year, no changes in our methods are anticipated. We will, however, monitor and refine the child referral process on the PICU to ensure that eligible children and families are not missed. Other hospitals in Phoenix will also be contacted regarding possible collaboration in subject recruitment. We will also use this time to establish and develop working relationships with additional community service providers, and to refine our Individualized Family Service Plan procedures and products. Additional measures of child functioning are being considered, and include the Stanford-Binet and the Vineland Social Maturity Scales.

SALT LAKE CITY IVH PROJECT
Project #7

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) -- Services begun at 3 months adjusted age vs. services begun at 18 months adjusted age.

LOCAL CONTACT PERSONS: Gary Chan, University of Utah Medical Center
Jack Dolcourt, Primary Children's Medical Center

EIRI COORDINATOR: Nancy Immel

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 10-8-1988

Rationale for the Study

This section will provide a review of research, including a discussion of current practices in early intervention, and a rationale for the current study. An overview of the study follows this.

Review of Related Research

Since the implementation of Public Law 94-142, an act which made provisions for educational assistance to all handicapped children, there has been a dramatic increase in the availability and quality of services for handicapped infants and children (Mulliken & Buckley, 1983). Public Law 99-457 is expected to bring another dramatic increase. This increase has been accompanied by a heightened public awareness of the importance of treating the infant once a handicap has been identified, and of directing efforts toward earlier identification, prediction, and prevention of such conditions (Bennett, 1987).

In the search for early identification strategies, Bennett (1987) has suggested that the low birthweight infant may be the prototype for understanding the development of most biologically at-risk infants. This statement is made because survival rates for low birthweight infants bear a direct relationship to their birthweights, and the surviving infants are particularly vulnerable to handicapping conditions. We have selected one particular subset of low birthweight infants, those infants who have experienced cerebral intraventricular hemorrhage (IVH) for this particular study.

Approximately 40% of low birthweight infants experience IVH (Bowerman, Donne, Silverman, & Joffe, 1984). This high incidence of IVH has caused the condition to be seen as the major health problem in the Neonatal Intensive Care Unit (NICU) (Volpe, 1987). In fact, a distinguishing characteristic of IVH infants is their propensity to develop serious medical complications (Sostek, Smith, Katz, & Grant, 1987).

An estimated 50-60% of infants who suffer IVH survive (Volpe, 1981); however, information on the future developmental progress in this population is limited and controversial (Hynd, Hartlage, & Noonan, 1984). Sostek et al. (1987) found that IVH related to Bayley mental and motor scores at one year of age, but not at two. At older ages, the findings are somewhat equivocal. For example, Williamson, Desmond, Wilson, Andrew, and Garcia-Prats (1982) found that 29% of IVH Stage One and Two LBW infants exhibited moderate handicapping conditions by the age of 3, whereas Papile, Munsick-Bruno, and Schaefer (1983) found that only 15% of such children could be diagnosed as having these handicaps. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Stage Three or Four IVH demonstrated moderate to severe handicapping conditions by the third year of life.

Our rationale for using IVH infants is that, given a subject population which is at extreme risk for experiencing neonatal complications associated with developmental dysfunctions (e.g., severe asphyxia, intrauterine growth retardation, neonatal meningitis, encephalitis, seizures, bronchopulmonary dysplasia, respiratory distress syndrome, apnea, and vision and hearing problems), it would seem to be important to determine if interventions beginning early in life could prevent the development of later handicapping conditions in IVH infants and reduce the levels of stress experienced by the families of these infants.

We chose the age at start issue to investigate which IVH infants, because an important question which needs further clarification is the age at which intervention should start for infants who have serious medical problems and who routinely spend up to three months in intensive care units. Since these infants currently receive only medical follow-up, this study provides a good opportunity to test such an hypothesis. EIRI staff have worked closely with Primary Children's Hospital and the University of Utah Medical Center in the past, and have established an excellent working relationship for this longitudinal study. It provides a rare opportunity for a high degree of replication of another study (Project #9), but with sufficient variation in the intervention to illuminate some of the parameters regarding the optimal level of intervention program for which theory provides no clear guide. From a systems theory perspective (Ramey, MacPhee, & Yeates, 1982), it seems important to document how education, social service, and medical systems interact with each other and how each in turn affects the family system.

Overview of Study

This study is examining the effects on children and families of being randomly assigned to one of two groups. Children in the experimental group begin a home-based early intervention program immediately upon release from the NICU. Children in the comparison group receive the medical follow-up services that have been available in the past until they are 18 months of age. At that time, they begin to receive the same home-based intervention program as the experimental group.

Prior to the implementation of services for this research project, the services to all infants included neonatal care at the respective hospitals and referral to the Utah State Department of Health Neonatal Follow-Up Clinic or follow-up from private physicians. Previous funding for these services was provided by the Utah State

Department of Health. However, those parents who did not access the NICU follow-up clinic paid for services themselves. This remains the standard level of care for all infants released from an NICU in the treatment area. Subjects in the delayed intervention group receive no other services associated with this project until they are 18 months of age. However, parents are free to access other services in the community if they desire. Parents are queried annually about services they have accessed during the time period of the study.

The current program of services begins with referral to the project by the University of Utah Medical Center and Primary Children's Medical Center, who initially contact the parents and refer the interested parents to the site coordinator. Once a child is enrolled, the project provides a package of services delivered by independent providers, including a licensed physical therapist, a child development specialist, and trained developmental examiners. The services provided by these professionals are coordinated by the EIRI site coordinator.

Methods

This section will provide a review of the subject assignment, demographic characteristics of the groups, a description of the program, and a discussion of the treatment verification and cost analysis.

The Salt Lake City IVH study was initiated as a pilot study. For those subjects in the pilot study cohort, pretest data was not available on some demographic variables. In those instances, the missing demographic data was gathered from the demographic survey completed at the time of the first posttest. Pretest data on some measures of family functioning and first year treatment verification data were also unavailable for that cohort and were excluded from the analysis.

Subjects

There are currently 55 children between 3 and 42 months of age (age corrected to 40 weeks to control for prematurity) enrolled in the study. Subject recruitment will continue through January 1989, at which time it is expected that 60 subjects will be enrolled.

Recruitment. Infants qualify for participation in the study if they have been a patient in a Neonatal Intensive Care Unit (NICU) at either Primary Children's or University of Utah's Medical Center, if they have experienced perinatal intraventricular hemorrhage (IVH) and if they reside in the catchment area for treatment. Subjects are matched on severity of hemorrhage and birthweight prior to being randomly assigned to experimental or control groups. Severity of IVH is divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories.

Assignment to Groups. Subjects who meet the inclusion criteria are identified upon discharge from the respective NICU. Parents of eligible infants are contacted via mail by the medical center in which the infant was a patient the month prior to reaching 3 months corrected age[1]. For each infant who meets the study criteria, parents must indicate willingness to participate in either of the experimental conditions, depending upon where random assignment places them. Infants are randomly assigned to the early intervention or delayed intervention conditions by a roll of a four-sided die after stratification by severity of IVH (mild or severe) and birthweight (under 1500 g or over 1500 g). Parents are informed of their infant's assignment after they give approval to participate in the study.

The only person at the site who knows the actual order of eligibility and enrollment of subjects is the EIRI site coordinator. In addition, the dates on which infants were assessed are carefully tracked to ensure that infants are assigned in the order in which they were eligible for initial pretesting.

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[1] In other words, a child who is born 4 weeks premature would not reach a corrected age of 12 weeks until 16 weeks after birth.

Subject Attrition. There have been 58 children enrolled in the study to date; however, one child died prior to pretesting, one child moved and could not be located by the project coordinator or hospital social workers, and one child dropped from the study because the parents moved and could not be located. Many of the children have medical concerns which necessitate returning to the hospital for a period of time, yet the study has shown success in assessing infants on schedule and has had very low attrition. Thus far 2 children in the early group and 1 from the delayed group have left the study.

In order to minimize attrition, the interveners and site coordinator in this project maintain updated telephone numbers and addresses for the participants. Data is collected in person or by mail approximately every 6 months for the child's first 18 months and monthly after 18 months, so there is frequent contact with the family. Arrangements have also been made to provide intervention services and assessment for those participants who move to another state. For example, children have been assessed in the states of New Jersey, Georgia, Washington, Wyoming, Colorado, and Idaho. In each case, qualified examiners have been utilized to administer follow-up assessments.

Demographic Characteristics. Demographic information has been collected on 55 subjects and their families. Information has been gathered by questionnaires regarding the family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families. Most of the children are from families who are residing in the urban area surrounding Salt Lake City. Eighty-two percent of the families currently live in the Salt Lake City area, while 17% live in rural areas of Utah, Idaho, or Wyoming. One family lives in Georgia. The current sample is composed of 89% Caucasian infants and 11%

non-Caucasian infants from both urban and rural areas. All of the participants live in homes where English is the primary language, and the greater majority (95%) live in two-parent families. The educational level of the mothers range from high school graduate to college graduate, with a mean education level of 13.0 years. The fathers' education level ranges from high school graduate to Ph.D., with a mean of 13.8 years of education. Annual family incomes range from $5,000 per year to over $50,000 per year. Median yearly income for the families is $23,500. Twenty-four percent of the families receive public assistance.

Intervention Programs

The interventions are in two phases for this project. The first phase, early intervention, provides sensorimotor intervention to the experimental group, while the control group receives the current level of community service (referral to the NICU follow-up clinic). The second phase, delayed intervention, begins when an infant reaches 18 months corrected age and consists of home- and center-based intervention services for all children. Both early intervention participants and control group participants receive intervention services in the delayed intervention phase. The rationale for providing sensorimotor intervention during the first 18 months is that IVH infants typically have motor deficits, and these deficits should be addressed first in intervention.

Early Intervention Service. The current level of service to subjects in the early intervention group (i.e., between 3 and 18 months corrected age) is a bi-monthly one-hour session with a licensed physical therapist. The therapist works with the infant and parent utilizing the Curriculum and Monitoring System (CAMS) Motor intervention materials.

The Curriculum and Monitoring System (CAMS) (Casto, 1979) was designed to meet the educational needs of young handicapped children. With training, the CAMS can be used by parents, teachers and paraprofessionals in the home or in an institutional/ school setting.

The CAMS programs were published and are now disseminated nationwide. Each of the curriculum programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. The five CAMS programs are: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development.

The **Receptive Language Program** teaches the student skills that do not require him to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The **Expressive Language Program** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building articulation.

The **Motor Program** is designed to teach gross and fine motor skills to children who have delayed motor skill development. The program stimulates normal motor development patterns, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The **Self-Help Program** is designed to teach basic skills for self-care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The **Social-Emotional Program** is designed to teach basic social-emotional skills to both normal and developmentally delayed children.

Sensorimotor intervention is provided by a licensed physical therapist certified in neurodevelopmental treatment for children and infants. Children in the early treatment group are referred at 3 months corrected age for initial sensorimotor evaluation utilizing the CAMS Motor Placement Test. At that time, scheduling and programming are discussed with the family. Frequency of intervention is determined by CAMS test scores, the type and quality of the infant's movement patterns, and the amount of interactive time available to parents. Most infants are seen bi-monthly during the first few months when movement patterns are limited. As movement increases, treatment frequency is increased to weekly visits if abnormal patterns or tone are noted, or if significant delays persist. However, if normal development with good quality of movement is proceeding, intervention may be limited to monthly or follow-up visits.

Treatments consist of activities to encourage appropriate movement patterns in a normal developmental sequence. The activities are updated constantly to accommodate progress and are designed to be integrated into daily family routines. Parents are present during treatment sessions which are approximately 45 minutes in length and include a review of progress on treatment goals, direct therapy, and an opportunity for the parent to work with the child. Parents are provided with written and illustrated home program activities.

Parents are asked to work with the child at home at least 20 minutes per day, five days per week, on techniques they have learned in the intervention sessions. Parents report the amount of time spent with the child implementing the CAMS intervention. According to preliminary data, 95% of the parents in the early intervention program are completing the assigned time requirements, and providing accurate records of their intervention sessions. Parents in the early intervention group report spending an average of 2 hours per week on intervention activities. For those few parents who are not following the intervention criteria, the physical therapist has maintained careful records of telephone calls and appointments attempted to obtain program compliance. The level of parental intervention and program involvement is used in analyzing the outcome for the children to determine if degree of parent involvement affects developmental outcome of the child.

Attendance and progress are monitored on an ongoing basis by the physical therapist's progress notes. The CAMS placement test checklist is updated as goals are met. If a child requires other equipment or services, for example, if a child needs a walker or the family needs financial assistance to buy rehabilitation equipment, the physical therapist refers the family to agencies in the Salt Lake City area or attempts to obtain equipment no longer being used by other children. The physical therapist also keeps a supply of equipment which she provides to parents on a no-cost basis.

Delayed Intervention. At 18 months corrected age, the infants in the delayed intervention group also begin to receive intervention services. The focus of intervention becomes center- and home-based for both early intervention and delayed intervention children. Therefore, all children at 18 months corrected age are assessed using the CAMS and goals are established for intervention.

The child development specialist meets with the parent and child for one-hour once each month and provides intervention in the area(s) of need identified by the CAMS placement test and parent concerns. The parent is asked to spend 20 minutes each day 5 days each week providing similar intervention with their child at home. The child development specialist talks with the parent via telephone at least once between clinic appointments to check on progress and answer questions.

A monthly home visit by the child development specialist establishes goals for the child dependent upon the CAMS placement test. A typical intervention session is usually 45-60 minutes in duration. Each session begins by asking how the child is doing and follows up on any problems (medical, family, etc.) discussed at the last visit. Then, using CAMS, the intervenor assesses the child's progress on the items suggested for home activities in the previous session. If the child passes these items, new activities are suggested and demonstrated. Following the assessment, the intervenor and child play with select toys which teach age-appropriate skills (shape sorters, bead stringing, puzzles, etc.).

Before the session ends, the intervenor writes down the suggested activities, gives examples of how to teach these activities, provides appropriate toys if necessary, and answers any questions the parent may have.

For example, the objective for a child may be to point out facial features. The child development specialist will teach the parent an exercise to teach the child facial features. When the next meeting occurs, the child development specialist has the child point out facial features. If the child shows competence in that area, a new objective is established. Some children have objectives in several domains, others may have only one area of delay. The child development specialist also provides recommendations to parents regarding problems or concerns such as toileting or behavior. The parent keeps a log of the time spent training the child during the week. When the child development specialist returns, she has the child demonstrate the new behavior, and if the child demonstrates competence in that area, a new objective is chosen and modeled for the parent.

If a child in the delayed intervention group is identified by the placement test as having a motor delay, s/he will be referred to the physical therapist for motor intervention. Those children in the early intervention group who still require motor services continue meeting with the physical therapist. If a child who has received motor services in the early intervention group no longer requires those services, s/he will terminate services with the physical therapist and receive center and home intervention only. The physical therapist follows the same procedures outlined in the early intervention service section.

In summary, all children begin individualized intervention services at 18 months corrected age. These individualized services will continue, and assessment will occur yearly until the child reaches 7 years of age. Some children may also obtain other services in the community. The access of services by the family is monitored on a yearly basis by having the parent complete an "additional services form."

Treatment verification. A number of procedures have been implemented to verify that treatment is being implemented as intended (see Table 7.1). They include:

Table 7.1

Treatment Verification Data for Early Intervention Group Salt Lake City Age-at-Start Study

Variable	Delayed Intervention Group			Early Intervention Group			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Intervenor Ratings of Parents *							
Involvement with Program		N/A		2.7	(.59)	17	
Knowledge of Child's Condition and Program		N/A		2.3	(.77)	17	
Support of Child's Program		N/A		2.3	(.69)	17	
• Hours per week parents spend implementing program suggestions+ *		N/A		2.0	(1.34)	17	
• Total home-based therapy sessions received between pre- and posttest *		N/A		9.0	(12)	13	
• Parent ratings of satisfaction with child's program Δ*		N/A		3.9	(.35)	15	
• Total hours of additional therapeutic services received by child between pre- and posttest $	139	(318)	23	286	(502)	18	.29

Δ Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions.

+ Information collected on a monthly basis from an interview between the home visitor and the parent.

* Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family.

$ Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., home nursing, physical therapy, tutoring) was obtained via a parental questionnaire.

1. Collection of attendance data. Both home visits and clinic visits are recorded in the subject's file. Phone contacts also are noted in the subject's chart by both the physical therapist and child development specialist. For the delayed intervention group, statistics regarding utilization of the NICU follow-up service are obtained from that agency. Currently, only 2% of the children referred to that service utilize the service. The early intervention group has shown good attendance, with 90% of the parents attending the intervention sessions regularly. Currently, this reflects only 2 parents who have not attended scheduled sessions.

Since the physical therapist and child development specialist record all appointments, attempted contacts and actual contacts made, data can be analyzed regarding level of attendance in intervention sessions and the child's developmental outcome.

2. Parent report of time. Parents estimate time spent working at home with their infant on activities suggested by the program. Theses records are collected by the intervenor and sent to the EIRI site coordinator for recording on a monthly basis. Telephone calls, with questions on time spent implementing the intervention, are made to check the accuracy of time estimates provided to the intervenor. Initial data indicates that 95% of the parents in the early intervention group are spending the recommended intervention time with the child. Analysis of videotapes of parent/child interaction will provide information on the judged quality of the parent intervention.

3. Parent satisfaction with program. Annually, parents are requested to complete a questionnaire regarding their satisfaction with the intervention services delivered by this program.

4. Intervenor ratings of parents. Intervenors rate the parents annually on their support of, and involvement with, their child's program, and on their knowledge of their child's condition and program.

5. Site review. A formal site review is conducted annually. The last site visit of the Salt Lake City IVH project was completed on June 15, 1988. Those participating in the site review included the site coordinator, the physical therapist, and child development specialist, and two parent representatives. The purpose of the review was to collect information about the nature and quality of early intervention services that are being delivered, to verify that the research being conducted by EIRI is being implemented as intended, and to collect needs assessment data which may be useful to site administrators.

The site review was conducted as a part of the treatment verification process which is described in the Treatment Verification Handbook for Research Sites (Frede, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Part II of the handbook.

Data Collection Procedures. Findings of the site review were based on the following specific data:

1. The site review took place at the office of Kathy Dudley and Victoria Hoagland, where the sensorimotor and expanded Curriculum and Monitoring System (CAMS) intervention is delivered.
2. The intervention and assessment folders of 7 randomly selected infants who are participants in the research study were examined by all members of the review team. Four of the infants whose folders were examined were in the delayed intervention group, and three were in the early intervention group.
3. The review team made direct observation of one early sensorimotor and one delayed expanded CAMS intervention session. The intervention sessions observed included the child, the intervenor, and the parent participating in the intervention activities.
4. The team considered information derived from interviews with interveners and parents regarding the intervention activities and the program.
5. The review team also inspected the facility in which the intervention occurs.

Findings. Implementation of the intensive intervention program has significantly changed how services are delivered to experimental subjects, therefore, findings for the early intervention condition were different than findings for the delayed intervention condition. For the first 18 months, the services delivered to the subjects in the early intervention condition were superior to those received by delayed intervention subjects.

The following section contains a summary of observations related to each of the five components that were evaluated in the site review.

Services for Children. This program does not contain an explicitly written statement of its philosophical approach and specific statements of the goals and objectives regarding the general services to children. When staff were interviewed, they were able to concur on the philosophy and goals of the program. It was recommended by the review team that written statements of the philosophy of the program and general goals and objectives be completed and dispersed to the staff involved.

Regarding other aspects of services to children, all criterion were fully met. There were appropriate service eligibility criteria and children being served met those criteria. Assessment procedure criteria likewise had been met. Appropriate intervention plans had been developed and monitored closely for each infant in the early intervention program, and procedures for assisting an infant's transition into another program were in place.

Curriculum. The intervention staff were observed to use the CAMS curricula consistently and were planning goals based on assessment of individual need as well as parent's input. Appropriate program review and planning activities are conducted regularly. Understandable written statements of procedures for informed consent, due process, and assurance of confidentiality are available.

In sum, the June 15, 1988, site review of the SLC IVH site was conducted to obtain information about the early intervention services that are being delivered there, to verify that EIRI research is being implemented as intended, and to collect needs assessment data for future program planning.

Based on the site review findings, no further recommendations were offered. The program will continue to enroll infants in the study until full enrollment is met. Services will continue to be provided to children in both treatment groups as previously described.

Cost of alternative interventions. The cost per child for the early intervention group represents an accumulated cost of intervention from July 1986 to July 1988, the total cost of two program years. The cost per child for the later intervention group represents the cost of services from the date the child turned 18 months of age and services began until July 1988, the end of FY 1987-88.

The cost of intervention per child in each group was calculated based on the total program costs for that group. Total program costs per group were then divided by the number of children in that group total. As seen in Table 7.2, program costs consisted of the costs of both direct service and administrative personnel, facilities, equipment, and staff transportation.

Table 7.2

Cost Per Child for Salt Lake City IVH (1986-88)

Agency Resources	
Direct Service Personnel	$2,039.43
Administrative Personnel	331.32
Facilities	347.64
Equipment	40.82
Transportation	36.54
Subtotal	$2,795.75
Contributed Resources	
Parent Time	2,237.85
Parent Travel	92.30
Subtotal	$2,330.15
Grand Total	$4,589.14

Personnel costs include wages and benefits for the physical therapist who provides sensory motor treatment for the early group, the developmental specialist who provides intervention, a part-time secretary, the diagnosticians, and the EIRI site coordinator. Cost of facilities included rent paid for office space and an indirect rate applied to personnel housed at Utah State University. Equipment costs include the cost of office furniture, computer, intervention toys and treatment equipment, and equipment loaned to parents (walkers, seating devices, etc.). Staff transportation for home visits was calculated at .21 per mile.

Cost per child was also determined with parent/volunteer time and, child transportation costs included. Parent time was based on the number of patient sessions and home visits (calculated at one hour per session), and the amount of time parents actually worked with their child. Parents spent an average of a little over 200 hours conducting physical therapy and other intervention in the home and attending formal sessions with the therapist and child developmentalist. As described earlier in this report, the average wage rate plus benefits was used to approximate the value of their time. Child transportation was determined by phone interview with parents, during which they reported the number of trips to the intervention center, round trip distance, and travel time. There is no transportation data for 1986-87; however, most families received intervention in the home, and transportation costs to parents were minimal.

Data Collection

Data is being collected for this study to determine the effects of intervention upon the child and the family. The assessment instruments have been chosen to provide some consistency of data collection across sites, but also provide information about children with intraventricular hemorrhage at birth and the unique experiences of their families.

Pretesting is done by the child development specialist, who does not know the group assignment of the child. Since there is a chance that the child development specialist could find out a child's assignment by posttesting, posttest diagnosticians were chosen who have no involvement with the project or the interveners. In this way, the diagnosticians are "blind" to the child's original group involvement in the study.

Recruitment, training, and monitoring of diagnosticians. Four diagnosticians are trained to administer the pretest and posttest measures. One diagnostician has a Ph.D. in psychology, two are Ph.D. candidates in psychology, and one has a master's degree in special education. These diagnosticians were recruited from Utah State University and the University of Utah Graduate Schools. Diagnosticians receive training in implementation of the tests by a certified assessment trainer. The diagnostician must complete five complete testings, one of which is videotaped and reviewed by the EIRI assessment coordinator. After the assessment coordinator verifies that the diagnostician has correctly administered the test, the diagnostician can begin testing children for the study.

To maintain records on the continued quality of the test results, shadow scoring of 10% of test administrations for each diagnostician is conducted by another trained diagnostician who has been administering the test for over three years. Interrater reliability indicates that the diagnosticians are administering the tests with a reliability level above .90. Testing is scheduled directly with the diagnosticians by the site coordinator.

Pretesting. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants are tested with the Battelle Developmental Inventory (BDI), and the parents complete the Parenting Stress Index (PSI), the Family Support Scale, (FSS), the Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES

III). All test and questionnaire protocols are sent to the EIRI site coordinator for scoring and placement in the EIRI file. Parents are paid $20 for their time in completing the evaluation session. This battery of tests provides information regarding both the infant's developmental level and early family reaction to the newborn.

Interim Testing. When infants are 6 months corrected age, their parents are mailed the Carey Infant Temperament Scale to complete. This questionnaire is returned directly to the site coordinator via postpaid mail. Parents are paid $10 for their time in completing the questionnaire.

The Carey Infant Temperament Scale assesses the parents' estimate of the infant's temperament. Scoring categorizes the infant into easy, intermediate, slow-to-warm, and difficult categories. This information will be compared with the ratings of the videotaped parent/child interaction to determine if the child's perceived temperament affects interactions with the parent. Videotapes of parent-infant interaction and one of motor development are completed when the infants are 12 months corrected age, by a trained child development specialist or a licensed physical therapist. These videotaped sequences are rated by trained individuals who are "blind" to the study design and subject assignment to experimental conditions. Parents are paid a $10 incentive for videotaping.

The videotape of motor functioning follows a specific script. The motor script has the child perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape involves the parent and child in play activities. In the first section, the mother and child play together for 15 minutes "as they would at home." Then for one minute the parent encourages the child to put the toys away. For the next two minutes, the parent reads to the child. Then the parent leaves the room for 45 seconds, and taping continues for two minutes after the parent returns to the room.

Posttest #1. Posttesting occurs at 18 months corrected age and annually thereafter. The child is given the BDI and the parent completes the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the last year, and a parent socioeconomic survey. Parents are paid $20 for completion of the evaluation.

The posttest data provides information regarding the child's developmental change in the first 18 months (and yearly thereafter), and the effect of intervention services upon the child's development. Change in the family during this time, including socioeconomic changes can be determined.

Posttest #2. The second posttest occurs at 30 months corrected age. The child is given the BDI and the Stanford Binet Intelligence Test Screening Test. The parent completes the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the last year, the parent socioeconomic survey, and the Carey Toddler Temperament Questionnaire. In addition, a videotape of parent-child interaction is completed. The posttesting schedule and number of infants assessed appears below as Table 7.3.

Table 7.3

Testing Schedule for IVH Study

Time of Assessment	Number Assessed to Date
3 Months	55
18 Months	45
30 Months	24
42 Months	0
54 Months	0

Results and Discussion

The purpose of the Salt Lake City IVH study is to compare the effectiveness of intervention begun early (at 3 months adjusted age) to intervention begun later (at 18 months adjusted age) for children with a history of perinatal intraventricular hemorrhage. The children are pretested when they are 3 months corrected age, and the first posttesting occurs at 18 months corrected age. The posttest analyses includes all children who have received the 18-month posttest.

Comparability of Groups on Pretest Measures

A pretest comparison of family demographic characteristics indicated that the early and delayed intervention groups were similar on most characteristics. However, as seen in Table 7.4, mothers in the early intervention group were significantly older than mothers in the delayed group. Fathers in the early group had significantly more education and more were employed at the technical managerial level and above, than were fathers in the delayed group. Fathers in the early group tended to be slightly older than fathers in the delayed group.

A comparison of the demographic characteristics of all children enrolled in the early and delayed treatment groups (see Table 7.5) indicated that at pretest, both groups were similar in most medical characteristics. However, infants in the early intervention group were of significantly lower birthweight and gestational ages, and demonstrated a higher incidence of bronchopulmonary dysplasia.

Table 7.6 shows infant pretest scores on the BDI and family measures of stress. The groups were similar on the personal-social, adaptive, and cognitive domain scores of the Battelle. However, they were significantly different (.05) on the Battelle motor and communication domain scores and on the Battelle total scores (.01). Where there were significant pretest differences on Battelle scores, the early intervention group received the higher scores. There were no significant differences between the groups on the measure of family stress.

Table 7.4

Comparability of Groups on Demographic Characteristics for Salt Lake City Age-at-Start Study

	Active Subjects Enrolled by June 1, 1988							Subjects Included in Year #2 Analyses						
	Delayed Intervention			Early Intervention				Delayed Intervention			Early Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/88	27.3	(9.0)	30	27.8	(9.0)	25	.85	30.5	(6.3)	23	31.4	(6.6)	19	.63
• Age of mother in years	28.1	(4.9)	26	31.4	(6.4)	24	.04	28.6	(4.6)	20	30.8	(5.3)	18	.18
• Age of father in years	29.8	(5.8)	26	32.5	(4.9)	23	.08	30.0	(6.0)	20	32.6	(4.7)	18	.14
• Percent male *	53.0	---	30	44.0		25	.50	44.0	---	23	43.0	---	19	.93
• Years of education for mother ∞	12.9	(2.0)	28	13.2	(2.0)	25	.56	12.9	(2.3)	22	13.5	(2.1)	19	.42
• Years of education for father ∞	13.0	(2.4)	28	14.7	(1.8)	24	.01	13.2	(2.4)	22	14.9	(1.7)	18	.02
• Percent with both parents living at home	97.0		30	92.0		24	.46	100.0		23	94.0		18	— +
• Percent of children who are caucasian *	83.0		30	92.0		25	.35	87.0		23	95.0		19	.41
• Hours per week mother employed ∞	11.4	(18.0)	28	8.4	(14.0)	25	.52	14.0	(20.0)	22	11.0	(15.0)	19	.55
• Hours per week father employed ∞	44.8	(10.0)	24	44.3	(15.0)	21	.89	47.0	(10.0)	18	43.0	(14.0)	16	.32
• Percent of mothers employed as technical managerial or above *	23.0		30	13.0		24	.32	26.0		23	17.0		18	.48
• Percent of fathers employed as technical managerial or above *	21.0		29	52.0		23	.02	26.0		23	53.0		17	.09
• Total household income Δ	$24,414	(17,357)	29	$30,140	(18,918)	25	.25	$27,196	(18,247)	23	$33,421	(18,785)	19	.28
• Percent receiving public assistance ∞	21.0		28	28.0		25	.59	23.0		22	26.0		19	.80
• Percent of children in day care more than 5 hours per week * ∞	43.0		28	21.0		24	.10	46.0		22	28.0		18	.26
• Number of siblings ∞	1.1	(1.0)	28	1.5	(1.8)	25	.31	1.2	(1.0)	22	1.5	(1.7)	19	.59
• Percent with English as primary language	97.0		30	100.0		25	--- +	100.0		23	100.0		19	1.00

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Δ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

+ One of the groups has no variance.

∞ Some posttest information was used to arrive at these figures.

Table 7.5

Comparability of Groups on Medical Characteristics for Salt Lake City Age-at-Start Study

	Active Subjects Enrolled By June 1, 1988							Subjects Included in Posttest #1 Analyses						
	Delayed Intervention			Early intervention				Delayed Intervention			Early Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
Birthweight (gms)	1,630	(700.0)	30	1,215	(460.0)	24	.01	1,644	(737.0)	23	1,169	(473.0)	19	.02
Grade of IVH* (percent with grade III or IV)	37		30	29		24	.77	48		23	37		19	.69
Gestational Age (Wks)	31.1	(3.5)	30	29.2	(2.5)	24	.03	31.2	(3.7)	23	29	(27.0)	19	.04
1-Minute Apgar	4.1	(2.5)	30	3.9	(2.4)	23	.78	4.1	(2.4)	23	3.9	(2.6)	18	.80
5-Minute Apgar	6.1	(2.0)	30	6.2	(1.6)	23	.87	6.0	(2.2)	23	5.9	(1.6)	18	.91
Apnea (%)*	50		30	67		24	.34	52		23	58		19	.95
Seizures (%)*	10		30	17		24	.75	13		23	21		19	.78
Respiratory Distress Syndrome (%)*	7		30	17		24	.46	4		23	16		19	.47
Bronchopulmonary Dysplaysia (%)*	53		30	79		24	.09	52		23	84		19	.06
Metabolic Acidosis (%)*	13		30	17		24	.74	0		23	16		19	—+
Retinopathy of Prematurity (%)*	23		30	38		24	.27	26		23	37		19	.47
Hypertension (%)*	3		30	8		24	.46	4		23	11		19	.45
Number of postnatal transfusions	7.7		30	12		24	.11	8.6		23	14.3		19	.07

Notes: *Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those who did not possess the trait were scored "0."

+One of the groups has no variance.

Table 7.6

Comparability of Groups on Pretest Measures for SLC/IVH Age-at-Start Study

	Active Subjects Enrolled by June 1, 1988							Subjects Included in Posttest #1 Analysis							
	Low Intensity			High Intensity				Low Intensity			High Intensity				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ESs	P Value
• Age in months at Pretes	3.4	(.7)	30	3.2	(.6)	25	.27	3.3	(.5)	23	3.3	(.6)	19	.00	.75
• Battelle Developmental Inventory (BDI)* DQs for:															
Personal Social	98.0	(45.0)	30	115.0	(53.0)	25	.20	97.8	(50.0)	23	103.5	(50.0)	19	.08	.72
Adaptive Behavior	80.3	(45.6)	30	99.1	(54.2)	25	.17	79.4	(49.3)	23	86.9	(47.6)	19	.17	.62
Motor	80.7	(22.1)	30	97.5	(19.6)	25	.01	83.0	(22.7)	23	93.7	(15.6)	19	.63	.09
Communication	79.6	(46.2)	30	106.0	(33.2)	25	.02	81.2	(50.4)	23	106.6	(34.3)	19	.57	.07
Cognitive	79.7	(46.2)	30	87.3	(38.6)	25	.52	83.0	(50.0)	23	94.7	(35.2)	19	.29	.39
TOTAL	84.9	(40.3)	30	102.0	(33.7)	25	.10	86.2	(45.0)	23	97.8	(35.0)	19	.35	.36
• Parenting Stress Index (PSI)$															
Child Related (range 47 to 235)	106.8	(21.6)	22	101.9	(21.2)	19	.48	105.7	(22.9)	15	102.5	(21.7)	15	.14	.70
Other Related (range 54 to 270)	132.6	(29.4)	22	127.2	(18.2)	19	.48	127.6	(31.6)	15	125.9	(17.1)	15	.05	.85
TOTAL (range 101 to 505)	239.4	(40.5)	22	229.2	(35.2)	19	.40	233.3	(45.5)	15	228.4	(34.9)	15	.11	.75

NOTES: *Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividng the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

$Statistical analysis and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desireable.

Posttest data have been collected on subjects as they reached 18 months adjusted age (again, see Table 7.1). An analysis of pretest data on only the subjects who were posttested indicated that the early and delayed groups shared similar characteristics on most demographic variables. However, the groups were found to be significantly different in terms of father's education. Fathers in the early treatment group had a significantly higher mean education level than fathers in the delayed treatment group. It should be noted that this is not the case for all subjects who have been enrolled in the study. This appears to be a problem that has been taken care of by randomized assignment.

The pretest medical characteristics of the children included in the posttest analysis (Table 7.5) indicated that posttested infants were similar on most medical variables. However, infants in the early intervention group had significantly lower birthweight and lower gestational age. They also had a higher incidence of metabolic acidosis, bronchopulmonary dysplasia, and received more postnatal blood transfusions. The children in the early intervention group who were posttested were generally smaller and sicker than the children in the delayed intervention group.

Table 7.6 shows pretest data for infant BDI performance and family measures. On pretest BDI performance, there were no statistically significant differences between early and delayed groups. In addition, pretest measures of parenting stress did not differ significantly between groups.

Effects of Early Versus Delayed Intervention on Measures of Child Functioning

Correlations were run between medical variables, demographic variables, pretest assessment measures, and outcome measures. Those variables that were most highly correlated with the outcome measures, and those variables that were statistically significant at pretest were used as covariates. ANCOVA results are shown in Table 7.7. There were statistical differences between groups on the BDI total and on the BDI personal social domain.

Table 7.7

Posttest Measures of Child Functioning for Alternative Intervention Groups for Salt Lake City/IVH Age-at-Start Study

		Delayed Intervention				Early Intervention						
Variable	Covariates&	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANOVA F	ES@	P Value
Age in months at posttest		19	(1)		23	19	(1)		19			.16 (t test)
Battelle Developmental Inventory (BDI) *@												
Personal-Social	1-7	78	(23)	73	23	85	(30)	89	19	3.15	.58	.09
Adaptive Behavior	1-7	88	(24)	84	23	88	(27)	93	19	.82	.23	.38
Motor	1-7	84	(30)	79	23	84	(29)	89	19	1.33	.28	.26
Communication	1-7	80	(24)	77	23	84	(25)	88	19	1.86	.39	.19
Cognitive	1-7	81	(23)	77	23	81	(24)	85	19	.89	.25	.35
Total	1-7	84	(22)	79	23	87	(25)	91	19	2.96	.41	.09

NOTES: * Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividng the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

@ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). Raw BDI scores were used to obtain these values.

& Covariates: 1 = Metabolic Acidosis; 2 = Transfusions; 3 = Birthweight; 4 = Gestational Age; 5 = Bronchopulmonary Dysplasia; 6 = Hypertension; 7 = Battelle Personal Social Raw Score

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 7.8 presents the results of the ANCOVA comparisons of posttest measures of family functioning. Covariates selected were those variables most highly correlated to the family outcome measures ($r > .60$), and the order of variables analyzed in the ANCOVA was determined by regression analysis. Results of the ANCOVA indicated no significant differences between the early and delayed intervention groups on outcome measures of family functioning.

Table 7.8
Posttest Measures of Family Functioning for Alternative Intervention Groups for Salt Lake City Age-at-Start Study

Variable	Covariate[∞]	Delayed Intervention Group					Early Intervention Group					ANCOVA F	ES[&]	P Value
		$\overline{X}$	(SD)	AdjX	%ile	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n			
Parent Stress Index (PSI)[*]														
Child Related Range (47 to 235)	2	100	(12)	100	55	15	105	(16)	105	65	14	.98	-.42	.33
Other Related Range (54 to 270)	3	115	(21)	115	40	15	120	(17)	120	48	14	.52	-.24	.48
Total Range (101 to 505)	1, 4	215	(29)	215	41	15	225	(29)	224	55	14	.79	-.31	.38
Family Adaptation and Cohesion Evaluation Scales (FACES)[+Δ]														
Adaptation Range (0 to 24)	3, 7	5	(6)	6		15	4	(4)	4		13	1.70	.33	.21
Cohesion Range (0 to 30)		9	(9)	---		23	10	(7)	---		17	.20	-.11	.66
Total Range (0 to 54)	3, 8	14	(13)	15		14	14	(9)	13		12	.25	.15	.63
Family Resource Scale (FRS)[$Δ]	2	125	(16)	126	65	15	129	(13)	128	68	14	.41	.13	.53
Family Support Scale (FSS)[$Δ]	5	28	(8)	29	54	23	33	(12)	33	69	17	1.21	.50	.28
Family Index of Life Events (FILE)[*]	6	11	(6)	10	40	23	11	(8)	11	34	17	.15	.17	.71

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). For the PSI, a lower percentile score indicates lower stress. For the FILE, a higher percentile score indicates a low number of stress-associated life events.

[+] Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the Early Intervention Group obtained a score closer to the "ideal."

[Δ] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 630 families with handicapped children).

[$] Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[∞] Covariates: 1 = PSI-Total; 2 = PSI-Child Related; 3 = PSI-Parent Related; 4 = Post-Hemmorogic Hydroencephalus; 5 = Hyperbilirubinemia; 6 = Birth Asphyxia; 7 = Hypoglycemia; 8 = Highest Degree Completed by Father

Conclusions

Since the Salt Lake City IVH study has not yet reached maximum enrollment, and all of the children pretested are not yet posttested, the results presented here are preliminary. However, some conclusions can be drawn. The statistically significant differences between the early and delayed intervention groups at pretest on four medical variables indicated that the random assignment procedure has not resulted in comparable groups on this study. The random assignment procedures have been reviewed and indicate that they have been implemented as prescribed. In addition, all coding has been rechecked and errors have been corrected.

The review of procedures revealed that more high birthweight (Grade I and II IVH) infants have been enrolled in the study, and fewer low birthweight (Grade III and IV IVH) infants have been enrolled. By chance, most of the high birthweight (Grade I and II) infants fell into the delayed intervention group, and the lower birthweight (Grade III and IV IVH) infants fell into the early intervention group, resulting in uneven birthweights and medical characteristics between groups.

Bennett (1987) reports that some less obvious handicaps are not apparent in children biologically at-risk for handicapping conditions until they reach school age. It may also be possible that differences between treatment groups will not be apparent until the subjects in this study are older. The finding that children in our study with Grade IV IVH appear to have more handicapping conditions than children with Grades I-III IVH corroborates findings of other studies (Wingate-Corey et al., 1988a, b), and suggests that infants with Grade IV IVH are more at risk than infants with Grade I-III IVH. We will continue to investigate these and other relationships as this longitudinal study progresses.

Posttesting now occurs at 18 months corrected age and annually thereafter. Those children who have been in the delayed intervention program for at least one year began posttesting in September, 1987. Initial analyses will be available on the 30 month posttesting by September, 1989.

Future Plans

The future plans for this project will include assessment of children to the age of 54 months. Enrollment will continue until 60 infants are participating in this study to assure an adequate sample for follow-up over the 54-month period allowing for attrition. During the course of this study, as the children grow older, further information will be gathered regarding neuropsychological and behavioral functioning through assessment instruments that are not appropriate for infants below 30 months. The types of measures being considered for inclusion are described briefly below.

Conners Symptom Checklist (Conners, 1970). The Conners, which has been standardized for children from 5-15 years of age, will be administered at the 54-month posttest. The Conners was developed to discriminate children who were normal, hyperkinetic, and neurotic based on parental report of symptoms. There is some criticism of the norming, validity, and reliability of the Conners, however, in a previous retrospective study conducted by EIRI of low-birthweight infants with IVH at ages 4-6, the Conners has provided valuable information regarding the incidence of hyperkinesis (now called Attentional Deficit Disorder [ADD] with hyperactivity).

Neuropsychological Assessment. Goldman, Stein, and Guerry (1983) report that, due to the rapidly developing neurological structure of the child, neuropsychological assessment considers the normal neurological development of the child. These authors suggest that it is very difficult to detect neurological deficits or delays prior to the age of 4. In addition, many tests which are commonly used in the neuropsychological assessment of children begin with a basal age of 36 months or higher.

The neuropsychological deficits or delays of the child with intraventricular hemorrhage during preschool and school years is of critical importance for planning intervention and education for these children. Neuropsychological assessment will provide information regarding not only areas of brain dysfunction, but attentional problems and learning disabilities.

As Rourke, Bakker, Fisk, and Strang (1983) point out, neuropsychological assessment usually includes information regarding development of language, motor, sensory, attentional processes, learning, and memory. However, in research one attempts to obtain as much information as possible in quantifiable and timely methods. Below are some possible instruments which could be used to provide neuropsychological information after subjects are 42 months of age.

Stanford-Binet Intelligence Scale (Thorndike, Hagon, & Sattler, 1986). The Stanford-Binet Intelligence Scale measures general intellectual ability. The test has been standardized for individuals from 2 to 18 years of age.

For the purpose of EIRI research, intellectual ability will be estimated from a sample of one subtest from each domain. The following subtests have been selected: vocabulary, pattern analysis, quantitative, and bead memory. Reliability between the our-test battery and the full battery ranges from .92 to .98.

Preschool Language Scale (Zimmerman, Steiner, & Evatt, 1969). The Preschool Language Scale is an instrument designed to evaluate language strengths and deficits in the areas of auditory comprehension and verbal ability. It also assesses articulation. The scale is designed for children aged 18 months to 7 years, or for children functioning within that age range.

To supplement information gained in the Binet and PLS, other brief assessment instruments could be used. For example, to determine the child's handedness and fine motor ability, a finger tapping test could be administered. Memory could be assessed by using the Categories Test (Reitan & Danison, 1974). Other sensory, tactile, or perceptual tests may be added if time and resources allow. In addition, an academic test could be added to the battery when the child reaches school age.

In addition to the assessment instruments which may be utilized, plans for the future include continuing to analyze costs and benefits of early intervention programs with infants at-risk for handicaps, such as this IVH population, with appropriate data, a comparison can be made regarding costs and benefits of each intervention phase of this study. Children will continue to be evaluated every three months to determine the need for additional services. Referrals will be made as indicated.

JORDAN VALLEY SCHOOL DISTRICT

Project #8

COMPARISON: Mildly to Severely Handicapped Children--Participation in a 3-day-per-week, center-based preschool program versus participation in an enhanced 5-day-per-week, center-based preschool program.

SITE COORDINATOR: Chris Giacovelli, Early Intervention Program Coordinator, Jordan School District

EIRI COORDINATOR: Mark Innocenti

LOCATION: Midvale, Utah

DATE OF REPORT: 10-8-1988

Rationale for the Study

Limited evidence exists in the early intervention literature to guide program decisions concerning the relative effectiveness of various intensities of program efforts (Casto & Mastropieri, 1986; White & Casto, 1985). The frequency and intensity of services in early intervention programs varies widely, based on factors such as philosophical orientation and professional judgement of child needs. With the passage of the federal mandate to provide services to all preschool-aged children with handicaps, P.L. 99-457, the intensities of programs may change to reflect the effect of more children in programs and related funding and personnel issues. The result may be that programs will reduce their intensity. Decisions that can potentially affect the lives of children and their families, such as the intensity of a program, must be made using a data base of the effects and costs of programs of varying intensity rather than be made according to bureaucratic needs. This study will help provide information for this data base by comparing two common intensity levels of intervention services for preschool-aged children with handicaps.

Review of related research. Although treatment intensity may be an important variable for early intervention programs, little systematic research has occurred in regard to intensity (Bailey & Bricker, 1984; Casto & Mastropieri, 1986; White & Casto, 1985). The field of early intervention commonly holds the belief that more is better (Casto & Mastropieri, 1986). This belief is common to our culture in many areas and may not be valid in all cases (e.g., the megavitamin controversy; Perils of, 1987; Vitamins, 1986).

Casto and his colleagues have reported on a series of meta-analyses that have examined intensity of intervention as a variable, and these analyses suggest that it may be an important variable with regard to program outcomes (Casto, 1988, 1987; Casto & Mastropieri, 1986; White & Casto, 1985). Specifically, Casto and Salehi (1987) found that as intervention time increased from less than 2 hours per week to over 20 hours per week, the intervention effect size increased from .59 to .86. When adjustments were made for age at start of intervention, quality of outcome measures, and time of measurement, the range of effect sizes was .45 to .88, again in favor of more intense interventions. These encouraging findings, however, must be viewed with caution. The results of many studies included in the analysis were confounded by the investigators' failure to distinguish intensity and duration of intervention and/or their failure to include other important variables in the analyses.

The research to be conducted will provide data to examine the question of program intensity. A comparison of a 3-day versus a 5-day-per-week early intervention preschool program may be of particular importance, as both represent common program intensities, and study results could affect personnel and funding issues. This study will be investigated from a Family Systems Theory framework (Haley, 1976, 1980), and impact on child and family outcomes will be assessed.

Overview of study. This study is being conducted in conjunction with the early intervention program of the Jordan School District. The Jordan School District has a history of active involvement in early intervention. Although prior to the 1987/88 academic year early intervention services had been funded by the Utah Division of Social Service, the intervention services were housed in a school in the Jordan District. With the passage of P.L. 99-457 and State of Utah mandates, the district has taken over the financial and administrative responsibility of early intervention for preschoolers with handicaps. This has resulted in the district expanding early intervention classrooms into neighborhood schools while retaining experienced staff. The Jordan District currently maintains early intervention classrooms at three schools. The district offers a variety of intervention options that range from home intervention to various classroom mainstream options, to placement in neighborhood day care centers.

The early intervention program previously provided 5-day-per-week, 2-1/2 hour-per-day classroom-based intervention services to a limited number of qualified children. A waiting list was maintained for eligible children, and classroom slots were filled on a first-come basis. With the transition of preschool services, the school district will be serving all eligible preschoolers and providing transportation. These factors resulted in a change in the service structure of the preschool program to a 3-day-per-week, 2-hour-per-day program.

This change in program intensity has raised concerns from preschool providers, school administrators, and parents of handicapped children. In conjunction with the Early Intervention Research Institute (EIRI) support, the Jordan School District has received research funds from the Utah State Office of Education to examine the question of program intensity. The standard program will provide 3-day-per-week, 2-

hour-per-day intervention services. Classrooms will have a 5:1 child teacher ratio. Some children will receive an enhanced program that provides 5-day-per-week, 2-hour-per-day services. There classrooms will have a 3:1 child teacher ratio and be provided increased time with therapists (communication and occupational therapists). This study will compare the effects of these two programs on child and family functioning.

Methods

This project is being conducted in conjunction with the Jordan School District's Early Intervention Program. The Jordan School District provides educational services to a large segment of children in the Salt Lake Valley of Utah. This area is the most populous in Utah.

The Early Intervention Program is mandated to provide services to all handicapped children, aged 3 to 5 years, who reside within district boundaries. The majority of these children are served in two district schools that also serve as elementary schools for nonhandicapped children. Other service options are possible (home services, self-contained school placement, services in a day care center) and are dictated by child needs. Programs are developmentally based on comprehensive individual assessments conducted by interdisciplinary teams. Parents are required to participate in the development of Individualized Education Plans (IEPs) and are encouraged to become involved in the educational process.

Progress of study. Discussions to initiate this study began in the spring of 1988 between the Jordan School District, the Utah State Office of Education (USOE), and EIRI. Specific negotiations occurred between the USOE and Jordan District for funding for this study. Research funds were granted in August 1988 by the USOE, contingent on EIRI participation and assistance. Cooperative efforts have begun:

subjects are being identified and assigned to groups, classroom activities have begun, and evaluation activities are scheduled.

Subjects. It is expected that the subject pool will total approximately 60 students. Fifty-two subjects have already been identified and assigned to groups.

Recruitment. The criteria for acceptance into the early intervention program is that adopted by the Utah State Office of Education. This criteria states that a preschool-aged child can receive services as a child with handicaps if they demonstrate a delay, from the norm, of -1.5 or greater standard deviation in three developmental areas, of -2.0 or greater standard deviation in two developmental areas, or a -2.5 or greater standard deviation in one developmental area. Multiple assessments and evaluators must be used in determining eligibility.

All parents of children identified as eligible for services are considered for possible placement in this study. Parents are verbally informed of the nature of the study, and that assignment to group is on a random basis. Parents are then given a consent form to read. Parents indicate their agreement or refusal to participate on this form. At present, 5% of parents approached have refused participation. The majority of these are parents of younger children (3 years) and have expressed the desire for a less intensive program.

Assignment to groups. Subjects will attend one of two schools dependent on address. As children are identified, the site liaison sends information on the child along with a rating of degree of handicap (mild, moderate, severe) based on the initial district assessment. This information is used to create a school by severity matrix (2 x 3). Subjects are placed in their respective placements in the matrix. For subjects in each cell, there are four possible sequences of assignment. For example, if a = Group 1 and b = Group 2, a sequence may be ABAB; three other permutations exist. A die is cast for the first child in a cell, and her assignment determines the sequence for the next three children in that cell. This process is repeated for each cell of the matrix as the first child in a cell is identified.

Demographic characteristics. Specific demographic characteristics are not yet available. The population from which subjects are drawn is primarily caucasian and of low to middle SES levels.

Intervention Programs

This study is a comparison of program intensity. The Jordan School District provides early intervention services at three schools. The two schools with the greatest enrollment, Altaview and Columbia, will be involved in this research project. Children in both the standard and more intensive (enhanced) programs are located at each school.

Where the question of importance in this study is program intensity, it is critical that other intervention factors be equivalent among groups. At each school, teachers have morning and afternoon sessions. Two teachers will be involved in this study (one per school), and each will teach a basic and enhanced classroom. Classrooms will consist of approximately 15 handicapped children; paraprofessional aides will be available. Child:teacher ratios will be group dependent. At one school, the standard class will be a morning class, at the other an afternoon class. This arrangement will help control for differences resulting from factors other than intensity.

A difference in programs at each of these schools is mainstreaming practices that occur. Columbia conducts a mainstreamed program that involves the enrollment of nonhandicapped children. These nonhandicapped children attend 3 days per week, both morning and afternoon classes, and constitute approximately 50% of the classroom population. Altaview does not have a formal mainstreaming program in place, but does use peer helpers from the kindergarten class for different activities. These differences in mainstreaming are equally distributed and should not present a problem to the interpretation and analysis of data.

Specifics related to child assessment, programming, and evaluation cannot be commented on since the intervention just began. Specifics related to services will be the same for subjects in both conditions. The only differences in programs will be those described below that deal with intensity. The teachers and staff in the early intervention program have a history of providing quality services, and it can be assumed that these quality services will continue.

The daily organization of the classrooms is similar, regardless of experimental condition. The teachers establish a number of activities that the children will alternate through during the day. These activities are either directed by the aides or the teacher. Children rotate through these activities in small groups. Generally, teachers select a number of themes that will be emphasized during a school week. For example, the color green, the shape of a square, and the concept under may be the weekly themes. Large group activities, such as singing and calendar, are scheduled between other activities. Children are provided a snack activity each day. Children in need of more individualized instruction, as dictated by child need, are pulled from other activities for individual or smaller (2-3 children) group instruction. Individualized instructional activities are usually conducted by the teacher.

Standard intervention program. This program will consist of 3-day per week, 2-hour-per-day intervention services. The teacher:child ratio in the classroom will be 1:5. Communication and motor therapies will be provided primarily through a consultation model where classroom staff take primary responsibility for goals and implement activities as appropriate throughout the school day. The communication therapist will be in the classroom approximately every other school day. Some children will receive individualized therapy from the therapist on these days. Motor therapy through individualized formats will be infrequent. Children's programs will be individualized by their IEP.

Enhanced intervention program. Children in this group will receive 5-day-per-week, 2-hour-per-day intervention services. The teacher:child ratio in this class will also be enhanced from the standard program and consist of a 1:3 ratio. Therapies will primarily be delivered through a consultation model, but therapists will be allowed more time to work with teachers. The communication therapist will be in these classrooms every school day. The communication therapist, in addition to consultation and individual therapy, will conduct a large group communication activity and will conduct snack-time activities such that naturalistic language teaching interventions are included. Individualized motor therapy can occur if dictated by child needs.

Treatment verification. A number of treatment verification procedures will be implemented to verify that the interventions for the experimental groups are being implemented as intended, and to ensure that the results are attributable to the intervention and have not been influenced by other factors. Verification will include weekly contacts with the site coordinator and regular visits to the program. Other program verification activities will include:

1. Collection of child attendance data.
2. Parent report of time they spend at home with their child on structured activities. Time and types of activities will be obtained. These data will be obtained on at least three occasions over the course of the school year. A home activity form used at the Des Moines site will be sent home

by the cooperating teachers and returned to them. This method of collecting parent home activity data has worked well at the Des Moines site.

3. Teachers will report their perception of the quality of involvement by the subjects parents in areas of attendance, knowledge, and support.

4. Parents will provide annual data describing the general health of their child.

5. Parents will annually provide information on activities (e.g., day care) or therapies (e.g., occupational therapy) the child receives that are not affiliated with the school early intervention program.

6. A site review will be conducted annually. EIRI has developed a set of guidelines and evaluation forms for conducting the site review; these are available from EIRI.

7. Records of time therapists spend in each classroom will be obtained to verify differences that occur.

These treatment verification measures will help ensure findings of treatment success or failure that are related to treatment and not other factors.

Cost of alternative interventions. Data on the costs of both program intensities will be collected. These data will be collected using the ingredients approach (described earlier in this report).

Data Collection

Data collection activities have just recently begun. The core battery used by all the EIRI longitudinal studies will be used at pre- and posttest. This battery includes the Battelle Developmental Inventory (BDI) as a measure of child functioning and five measures that assess parent and family functioning. These are the Parent Stress Index (PSI), Family Resource Scale (FRS), Family Support Scale (FSS), Family Adaptability and Cohesion Evaluation Scale (FACES), and the Family Inventory of Life Events (FILE). Evaluation of family functioning has not received empirical attention in the early intervention literature (Casto & Mastropieri, 1986), but may be an important outcome variable. These measures will provide information on family functioning that may influence future decisions of program intensity.

Recruitment, training, and monitoring of diagnosticians. Diagnosticians for this study will be drawn from a pool of certified BDI examiners in northern Utah. The presence of other EIRI longitudinal studies in Utah has resulted in an available pool of EIRI certified examiners. All examiners have been certified by the EIRI assessment coordinator after completion of a workshop, practice administrations, and an assessment coordinator observed, and satisfactorily completed BDI administration. These certified examiners have administered numerous BDIs.

In addition, 10% of each examiners' BDI administrations will be shadow scored by the site coordinator for accuracy. EIRI clerical staff will also review all BDI protocols for errors. These combined procedures will, and have in other EIRI studies, result in reliable and valid BDI data.

Pretesting. Pretesting will occur in September and October 1988. The plan for pretesting is as follows: Appointments will be made with parents to come for evaluation with their child. Evaluations will occur at the child's school. Examiners will discuss their role. Examiners will be blind to subject group placement, and parents will be requested not to discuss their child's program. The BDI will be administered. Examiners will hand out the family measures, provide a brief description, and answer questions that arise. These measures will be completed during the appointment. Examiners will review these measures to ensure completeness. Parents will be paid $30 for their participation.

Posttesting. Posttesting will occur in April and May of 1989. The core battery will again be administered. Site specific complementary measures will be selected during the year for use at posttest. Posttest procedures are expected to be similar to those at pretest.

Future Plans

The majority of information presented in this report is a future plan. Research activities are progressing, and no difficulties have been encountered or are foreseen. The results of this study will help create a data base in an area where little data exists. These data will be useful in determining "best-practices" for preschool-aged children with handicaps.

CHARLESTON, SOUTH CAROLINA IVH PROJECT
Project #9

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH)--Services begun at 3 months adjusted age versus services at 12 months.

LOCAL CONTACT PERSON: Conway Saylor, Ph.D.

EIRI COORDINATOR: Lee Huntington

LOCATION: Charleston, South Carolina

DATE OF REPORT: 10-8-1988

Rationale for the Study

As described in the rationale for the LSU/IVH site (p. 60), there are approximately 14,000 low-birthweight infants born in the United States each year. Of these 14,000 infants, 5,600 suffer periventricular-intraventricular hemorrhage (IVH). Simply described, a periventricular-intraventricular hemorrhage is the development of a lesion in the infant's brain which produces abnormal bleeding from cranial capillaries which may extend into the ventricular system. The bleeding is believed to result in different degrees of neurological damage based on the severity of the hemorrhage (Volpe, 1981). For more detail on IVH and its effects, refer to the previous discussion of the LSU/IVH site.

Overview of Study

Intervention programs for low-birthweight infants have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and virtually all have excluded children who have suffered major neurological insults such as IVH (for reviews see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey, Bryant, Sparling, & Wasik, 1984). At issue for this study are the effects and related costs of beginning intervention at different ages for infants who have serious medical problems and who routinely spend up to three months in intensive care units.

The specific comparison for this study was between early, intensive motor-development oriented intervention and later, comprehensive developmental services. This comparison was chosen because a high proportion of the developmental problems encountered by these infants are motor development related. Since these infants routinely receive only medical follow-up until a particular problem or delay is noted, this study provides a good opportunity to test the age-at-start hypothesis.

Methods

This study was implemented in collaboration with the Departments of Pediatrics and Psychiatry of the Medical University of South Carolina in Charleston, South Carolina. The full-time staff of this project consisted of a home interventionist and two physical therapists. The project was overseen on a part-time basis by a director and supported on a part-time basis by a coordinator and a secretary.

Subjects

The sample as of September 1, 1988 was composed of 49 infants actively in the project, from both urban and rural areas around Charleston. Subject recruitment will continue through October, 1988, at which time it is expected that 60 subjects will be enrolled. Twenty-seven infants have had their one-year posttest. By September 1, 1989, approximately 50 infants will have received their one-year posttest, and approximately 30 will have had their two-year posttest.

Recruitment. Infants qualified for participation in the research if they had been patients in the NICU at the Medical University of South Carolina, if they had experienced perinatal intraventricular hemorrhage (IVH) or had a birthweight of less that 1000 g, and if they resided in the catchment area for treatment (60 mile radius). Severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories. Birthweights were categorized as less than or equal to 1000 g and greater than 1000 g.

Subjects who met the inclusion criteria were identified while in the NICU. Parents of eligible infants were contacted while the infant was still in the NICU and subsequent telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions depending upon where random assignment places them. Infants were randomly assigned to treatment or control conditions by a roll of a four-sided die after stratification by severity of IVH (mild or severe) and birthweight (under 1000 g or over 1000 g). Parents were informed of their infant's assignment after they give approval to participate in the study.

The only people at the site who knew the actual order of eligibility and enrollment of subjects were the site coordinators. The dates on which infants were born were the basis for sequence of enrollment, and infants were assigned to experimental conditions in order of eligibility.

Currently, this project has had low attrition. A total of 56 subjects have been enrolled. Five infants (9%) moved to areas inaccessible to the project. Two (3.5%) dissappeared, giving the project no notice or address, and two (3.5%) infants died. Thus, a total of 84% of the infants enrolled are still in the program. The rate of attrition will continue to be monitored and assessment will be made regarding differential drop-out rates in the contrasting conditions. Socioeconomic factors and family variables will also be assessed for those who leave the study. In addition, families were contacted frequently for intervention and assessment, so records were maintained regarding the family's current address and telephone number.

Demographic Characteristics. Children were enrolled in this study in two cohorts. There are currently 49 children between 3 and 35 months of age enrolled in the study. The first 19 children were a pilot cohort, and their pretest data consists of the Battelle Developmental Inventory (BDI). The next 30 children were enrolled after the full testing battery (described below) had been developed. The prettest data available at this time is from both the pilot cohort and the more recently enrolled cohort. The posttest data available at this time is predominantly from the pilot cohort, and thus consists mainly of BDI scores. Table 9.1 represents the available demographic data for these infants.

All of the children were from families who reside in the metropolitan area of Charleston, South Carolina. The ethnic background of the sample was approximately 45% Black and 55% Caucasian. All of the participants live in homes where English are the primary language, and there were slightly more two parent than single parent families (65% vs 45%). One third of the enrolled families were receiving public assistance. Only one variable differed significantly between the early and delayed intervention groups. There was a higher proportion of males in the delayed intervention group than in the early intervention group.

Table 9.2 represents the medical demographic data of the early and delayed intervention groups. The left hand data is for all active subjects enrolled by July 1, 1988, and the right is for those infants included in this years posttest data set. The groups in the overall sample only differed on the proportion of children showing retinopathy of prematurity with a higher number in the early intervention group. There were, however, several important differences in complications between the early and delayed intervention groups in the subsample of infants for whom there is posttest data this year. As represented on the right of Table 9.2, the early intervention group had significantly lower gestational ages and a higher number of the complications associated with lower gestational age; longer time on a ventilator, more bronchopulmonary dysplasia, and more retinopathy of prematurity. The differences between the groups will be discussed in relation to the data analyses.

Table 9.1

Comparability of Groups on Demographic Characteristics
for South Carolina Age-at-Start Study

	Active Subjects Enrolled By June 1, 1988						
	Delayed Intervention			Early Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/88	21.3	(9.7)	24	20.5	(8.8)	25	.73
• Age of mother in years	27	(6.6)	22	28	(5.9)	25	.41
• Age of father in years	30	(6.8)	19	31	(6.6)	15	.61
• Percent male*	33		24	68		25	.01
• Years of education for mother	12.4	(1.6)	22	12.7	(2.4)	24	.53
• Years of education for father	12.3	(1.6)	20	12.7	(2.2)	20	.52
• Percent with both* parents living at home	69		23	64		24	.61
• Percent of children who are caucasian*	52		23	37		23	.38
• Hours per week mother employed	4	(4.6)	19	11	(17.4)	21	.02
• Hours per week father employed	15	(19.9)	16	20	(25.7)	17	.54
• Percent of mothers employed as technical managerial or above*	0		23	5		21	.85
• Percent of fathers employed as technical managerial or above*	5		20	6		17	.91
• Total household income	13,760	(10444)	23	16,673	(13085)	23	.41
• Percent of income spent on unreimbursed medical educational expenses for child							
• Percent receiving public assistance	45		20	43		21	.89
• Percent with mother as primary caregiver*	83		24	80		25	.77
• Percent of children in day care more than 5 hours per week*	9		23	10		21	.93
• Number of siblings	1.7	(2.1)	23	1.2	(1.5)	24	.33
• Percent with English as primary language	100			100			1.00

Notes: *Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not posessing the trait were scored as "0."

Table 9.2

Comparability of Groups on Medical Characteristics for South Carolina Age-at-Start Study

	Active Subjects Enrolled By June 1, 1988							Subjects Included in Year #2 Analyses						
	Delayed Intervention			Early Intervention				Delayed Intervention			Early Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
Birthweight (gms)	1,110	(391.0)	19	1,057	(380.0)	21	.67	1,296	(483.0)	8	1,073	(339.0)	10	.29
Grade of IVH * (percent with grade III or IV)	54		24	60		24	.90	54		13	64		13	.87
Gestational Age (Wks)	29	(2.9)	24	28	(2.7)	24	.36	31	(2.7)	13	28	(2.5)	13	.02
Days on Ventilator	15	(20.0)	24	22	(20.0)	24	.24	12	(19.0)	13	28	(20.0)	13	.05
Apnea (%)*	45		24	54		24	.57	38		13	54		13	.45
Seizures (%)*	4.2		24	20.8		24	.09	8		13	23		13	.30
Respiratory Distress Syndrome (%)*	79		24	82		24	.45	0.85		13	100		13	.14
Bronchopulmonary Dysplaysia (%)*	37		24	46		24	.57	30		13	69		13	.05
Retinopathy of Prematurity (%)*	4.2		24	25		24	.04	0		13	38		13	.05

Notes: *Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those who did not possess the trait were scored "0."

Alternative Intervention Programs

The comparison for this study was of an early versus delayed intervention program. Intervention occurred in two phases. During Phase I, the early intervention group received a sensorimotor intervention beginning when the infants were 3 months of age and the delayed intervention group received only routine medical services. In Phase II, the delayed intervention phase, all infants received home intervention services and sensorimotor services as needed, and parents and infants participated in an optional program of monthly center-based groups. The components of these intervention phases will be discussed in more detail in the following sections. The comparisons of the effects of these different manipulations will be discussed in the results section.

Early Intervention Program

The intervention program consisted of a package of services delivered by project staff, including a licensed physical therapist, a child development specialist, and a trained developmental examiner. The services provided by these professionals were coordinated by the site coordinator. These providers offered motor intervention services until infants were 12 months of age (corrected for prematurity) and home intervention services for all infants after 12 months.

Experimental subjects between 3 and 12 months corrected age received a twice-monthly one-hour session with the physical therapist. The therapist worked with the infant and parents utilizing the Curriculum and Monitoring System (CAMS) motor intervention materials (Casto, 1979) which were designed to meet the developmental needs of young handicapped children in gross and fine motor areas by stimulating normal motor development patterns, beginning with raising the head and proceeding through running, hopping, and drawing squares and diagonals. First, a placement test was administered in the motor skills domain to determine which objectives should be offered to the child. Second, curriculum books were provided with developmentally sequenced objectives and activities for assisting in a child's gross and fine motor development for ages birth to 5 years of age.

A typical intervention session included the therapist working with the child, with the parent present. The physical therapist also instructed the parent on exercises that the child could do at home, and the parent practiced and demonstrated competence on the exercises before beginning home intervention. The parents were requested to work with the child at home for at least 20 minutes per day, 5 days per week, on techniques they learned in the intervention sessions. The physical therapist telephoned the parent on weeks they did not meet to answer questions and provide guidance on implementation of intervention techniques. Attendance and progress were monitored on an ongoing basis by the physical therapist's progress notes and the motor program placement test checklist were updated as goals were met.

Delayed Intervention Program

Prior to this research project, all infants who were in Neonatal Intensive Care Units were referred to the South Carolina State Department of Health Neonatal Follow-up Clinic and received routine medical follow-up from private physicians or clinics. Previous funding for these services was provided by the South Carolina Department of Health, for those utilizing the follow-up service, or by patient self-pay for those using private physicians or clinics. These services remain the standard level of care for all infants in the treatment area. Control group subjects typically received no other services during the first phase of the study, as very few services were available. However, parents were able to access services in the community if they desired. Parents were queried about services they have accessed during the time period of the study.

At 12 months corrected age, all subjects enrolled in the study began expanded intervention programs utilizing the Curriculum and Monitoring System (CAMS) programs. The five CAMS Programs are: (a) receptive langauge, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development. The delayed intervention offers the other four domains of the CAMS in addition to the motor domain that was offered during the early intervention.

The **Receptive Language Program** teaches the student skills that do not require him to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The **Expressive Language Program** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building articulation.

The **Motor Program** is designed to teach gross and fine motor skills to children who have delayed motor skills. The program This program is intended for children with mild to moderate impairments.

The **Self-Help Program** is designed to teach basic social-emotional skills to both normal and developmentally delayed children. The developmentally sequenced program begins with teaching a child to respond to a person and proceeds through teaching him to handle frustration and exhibit self-control.

The **Social-Emotional Program** is designed to teach basic social-emotional skills to both normal and developmentally delayed children. The program, which is sequenced developmentally, begins with teaching a child to respond to a person and proceeds through teaching him to handle frustration and exhibit self-control.

For this study, a child development specialist administered the CAMS placement tests, determined developmental levels, and set appropriate goals for intervention in each domain. All subjects were given placement tests in motor, social-emotional, self-help, receptive language, and expressive language domains and then participated in an expanded intervention program, which included weekly contacts with an infant specialist. The interventionist alternated twice monthly home visits with telephone contacts and encouraged parents to attend monthly center based sessions for parent-infant dyads.

The child development specialist met with the parent and child for one-hour twice each month and provided intervention. For each session, an objective was determined for the child, the child development specialist modeled the training for the parent, and the parent demonstrated the technique. The parent were asked to spend 20 minutes each day, 5 days each week providing similar intervention with their child at home. The child development specialist called the parent via telephone weekly between clinic appointments to check on progress and answer questions. When the child returned for the next session, the child development specialist had the parent elicit the new behavior from the child. If the child demonstrated competence in that area, a new objective was chosen and modeled for the parent.

For example, the objective for a child ht be to point out facial features. The specialist might have taught the parent an exercise to teach the child facial features. At the next meeting, the specialist would have the child point out facial features. If the child showed competence in that area, a new objective would be established. Some children would have objectives in several domains, others may have only one area of delay. Recommendations were also provided to parents regarding problems or concerns such as toileting or behavior problems of the child.

On alternating weeks to the home intervention sessions, the parent and child attended a group session (twice-monthly). The group sessions combined hands-on intervention activities utilizing the CAMS curricula with a guest speaker who focused on some intervention topic such as techniques of social reinforcement for training self-help behaviors.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was be referred to the physical therapist for motor intervention. Those children in the early intervention group who still required motor services continued meeting with the physical therapist. If a child who received motor services in the early intervention group no longer required those services, s/he terminated services with the physical therapist and received home intervention only. The physical therapist followed the same procedures outlined in the early intervention service section.

Treatment Verification. A number of procedures were employed to verify that treatment are being implemented as intended. The main procedure completed at this time was a formal site review, conducted annually. The Charleston site review was conducted on September 20 and 21, 1987. The purpose of the site review was to collect information regarding the nature and quality of the early intervention services delivered at this site. Documentation of treatment implementation occured to ascertain if the intervention services are being provided as intended and that the project are remaining faithful to the research protocol. The site review was conducted according to procedures described in the Guide for Site Reviews of EIRI Research Sites, in the Treatment Verification Handbook for Research Sites (EIRI, 1987). The site was rated excellent on all aspects of the evaluation except for implementation of Individualized Family Service Plans.

Two other methods have been used to examine parental participation in the intervention. Both of these were implemented after most of the first cohort of infants had had their one-year posttese, and thus the data is not available at this time. First, the interventionists are tracking the number of center and home based vidits that an infant has during each month. Second, the interventionists ask the parents once a month to estimate the amount of time during the past week that they spent working with their infant on activities suggested by the interventionist. When the interventionist records this information, they also rate the parents accuracy of estimation. This data will be available for next years report.

Cost of the early intervention. The cost per child for the LSU/IVH site was calculated using the ingredients approach described earlier and are presented in Table 9.3. The costs are presented for the early intervention group only.

Calculation of the cost per child for this intervention was based on the cost to the program of the following resources:

Personnel Resources: Salary plus benefit are calculated for all direct service personnel (2 special education teachers and one physical therapist) and administrative staff (1 coordinator and 1 secretary) based on the proportion of their FTE devoted to the service portion of this project.

- The services of a vision specialist and a special education teacher were purchased on a contractual basis throughout the year. Consultation costs were based on the proportion of the time that applied to the direct service.
- Parent time was required during the home visits and cost for this time was calculated according to the method discussed previously. The cost per child for this time was based on a average of 54.63 hours per parent year.

Table 9.3

Cost Per Child for SC/IVH (1986-1987)

Resources	Cost Per Child
Personnel:	
Direct Service	$ 2,202.92
Administrative	654.52
University Indirect Cost[1]	1,114.40
Transportation	161.18
Materials	54.63
Miscellaneous	53.49
Subtotal	$4,258.64
Contributed Resources	
Parents	1,547.23
Volunteers	6.30
Subtotal	$1,553.53
TOTAL	$5812.17

[1] University indirect rate is 36%. Includes facilities, equipment, capital improvements, and some administration.

- Volunteer time was provided for the center based program. Eight guest speakers provided a total of 12 hours of time to this program.

Facilities: Calculated by applying the indirect rate of 13% to the total direct service and administrative staff costs.

Staff Transportation: For 2 interventionists to make home visits. Compensated at $.21 per mile.

Materials and Supplies: Annual cost of all consumables for the program.

The cost per child of $3.515 puts this program at approximately the average cost of the programs studied.

Data Collection

Data were collected for this study to determine the effects of intervention upon the child and the family. The assessment instruments were been chosen to provide some consistency of data collection across sites, but also provide information about children who experienced intraventricular hemorrhage at birth and the unique experiences of their families.

A local diagnostician was hired to administer the pre- and posttest measures. Testing was scheduled directly with the diagnostician by the site coordinator. Shadow scoring of 10% of test administrations is being performed, and data on the reliability of this diagnostician will be reported in the future.

Pretest. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants were tested with the Battelle Developmental Inventory (BDI), and the parents completed the Parenting Stress Index (PSI), the Family Support Scale, (FSS), the Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III). The BDI was administered by a trained diagnostician who was unaware of the infant's group assignment. All test and questionnaire protocols were sent to the program coordinator for scoring and placement in a data file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the newborn.

Posttest. Posttesting occurred first at 12 months corrected age and annually thereafter. The posttest battery was administered by the same diagnostician who is "blind" to the subject's group assignment. The child was given the BDI and the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the last year, and a parent socioeconomic survey. Parents were paid $20 for completion of the evaluation.

The posttest battery was designed to provide information regarding the child's developmental change in the first 12 months (and yearly thereafter), and the effect of intervention services upon the child's development. Change in the family during this time, including socioeconomic change can also be examined.

Results and Discussion

The purpose of this study was to examine the utility of an early, intensive motor intervention compared to a delayed comprehensive developmental intervention for a group of infants at risk for developmental delays because of a history of intraventricular hemorrhage or very low birthweight.

Comparability of Groups on Pretest Measures

Table 9.4 represents the data on the comparability of groups on the pretest measures. The first two columns represent the comparison of all infants enrolled before June 1, 1988. There were no significant differences on any of the measures of infant or family functioning. There was a marginal difference in the ratings of the child related dimension of the Parenting Stress Index, with the parents in the early intervention group perceiving more stress related to their child than the parents in the nonintervention group.

The third and fourth columns of the table represent the comparison of pretest Battelle Developmental Quotients for those infants who are included in the analyses of data from the first postest. Again, there were no significant differences between the Early and Delayed Intervention groups on the pretest measures. There was, however, a reasonably large effect size on the cognitive dimension of the Battelle which suggests that, although not statistically significant, there may have been a large difference between the groups. The scores for this dimension, along with the

Table 9.4

South Carolina Age-at-Start Study
Comparability of Groups on Pretest Measures

	Active Subjects Enrolled By June 1, 1988							Subjects Included in Year #2 Analyses								
	Delayed Intervention			Early Intervention				Delayed Intervention			Early Intervention					
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ANOVA F	ES$	P Value
•Age in months at Pretest	4.0	(1.2)	24	3.7	(1.2)	25	.48	4.3	(1.2)	13	4.3	(1.3)	14	0.002	0.0	.96
•Battelle Developmental Inventory (BDI)* DQs for:																
Personal Social	75	(45)	24	82	(52)	25	.63	54.0	(39)	13	53.0	(37)	14	0.00	-.02	.75
Adaptive Behavior	60	(48)	24	56	(55)	25	.78	41.0	(45)	13	34.0	(46)	14	0.16	-.16	.69
Motor	71	(28)	24	72	(27)	25	.86	59.0	(25)	13	60.0	(27)	14	0.00	.04	.96
Communication	58	(38)	24	50	(41)	25	.50	40.0	(33)	13	36.0	(39)	14	0.06	-.12	.80
Cognitive	56	(42)	24	42	(32)	25	.21	59.0	(44)	13	38.0	(29)	14	2.16	-.48	.15
TOTAL	69	(38)	24	63	(39)	25	.60	55.0	(38)	13	44.0	(37)	14	0.59	-.29	.45
•Parenting Stress Index (PSI)**																
Child Related	106.0	(17)	12	116.0	(16)	16	.10									
Other Related	122.0	(26)	12	132.0	(28)	16	.37									
TOTAL	229.0	(37)	12	242.0	(34)	16	.34									
•Family Adaptation and Cohesion Evaluation Scales (FACES)**																
Adaptation	2.2	(1.3)	12	2.8	(1.1)	15	.19									
Cohesion	2.0	(.95)	12	2.4	(1.0)	15	.31									
TOTAL	2.1	(.74)	10	2.0	(.78)	14	.70									
•Family Resource Scale (FRS)	116.0	(16.0)	11	126.0	(72.0)	15	.67									
•Family Support Scale (FSS)	29.3	(13.3)	12	25.8	(10.2)	16	.45									
•Family Index of Events (FILE)**	11.0	(6.11)	12	10.0	(6.0)	16	.64									

*Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

**Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

ΔAnalyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

$ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass [1976], Tallmadge [1977], and Cohen [1977] for a more general discussion of the concept of Effect Size).

infants' gestational ages and number of days on a ventilator, will be used as covariates in the examination of the effects on the intervention.

Because the posttest data at this time are predominantly from those infants who were in the pilot cohort, there are not enough data on family functioning or on the measures of attendance and parent child interaction for meaningful analyses at this time. By this time next year there should be at least 40 children for whom there will be both pre and posttest family functioning measures as well as attendance and interaction measures.

Effects of Early Versus Delayed Intervention on Measures of Child Functioning

Table 9.5 represents the data for the one year posttest BDI scores for the early and delayed intervention groups. Because the groups differed on the measures of

Table 9.5

Posttest Measures of Child Functioning for Alternative Intervention Groups for South Carolina Age-at-Start Study

Variable	Covariates[∞]	Delayed Intervention Group				Early Intervention Group				ANCOVA F	ES[Δ]	P Value
		$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n			
• Age in months at Posttest	---	14	(2.3)		13	14	(1.5)		14	.45		.51
•Battelle Developmental Inventory (BDI)[*]	1, 2, 3											
DQs for:												
Personal Social		68	(25.0)	64	13	57	(25.0)	61	14	.71	-.12	.83
Adaptive Behavior		81	(31.0)	75	13	72	(32.0)	77	14	.14	.06	.88
Motor		67	(28.0)	64	13	62	(27.0)	63	14	.03	-.04	.98
Communication		82	(36.0)	74	13	70	(41.0)	77	14	.22	.08	.83
Cognitive		79	(32.0)	74	13	75	(39.0)	79	14	.00	.15	.76
TOTAL		77	(29.0)	71	13	68	(31.0)	73	14	.19	.07	.70

[*] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[Δ] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977; for a more general discussion of the concept of Effect Size).

[∞] 1 = BDI Cognitive; 2 = Gestational Age; 3 = Days on Ventilator.

medical complications, the BDI scores were analyzed in analyses of covariance (ANCOVA) using the pretest BDI scores on which the groups showed the largest effect sizes, the communication dimension, combined with the infants' gestational ages and number of days on a ventilator as covariates. After adjusting the means for the pretest differences on these variables, the range of differences in the unadjusted scores was reduced to 1 to 5 points. Also, the relative postition of the groups on the Adaptive Behavior, Communication, and Cognitive subscales, as well as on the Total score were reversed.

Initial analyses of the demographic data revealed that the delayed intervention group had a higher proportion of males than did the early intervention group. The posttest BDI scores were analyzed using sex as a grouping variable to examine whether a predominance of males would affect the group averages. There were no significant differences between the scores of the male and female infants at either the pre- or posttest.

It is important to note that the groups presented at this point did not differ significantly on any of the subscales of the BDI. While the trends in the unadjusted scores are for the delayed intervention group to perform slighty better, the scores adjusted by the covariates indicate that the groups do not significantly. When more posttest data are available from the overall group, which did not differ on gestational age or days on ventilator, more valid comparisons will be made. Currently, there are not enough subjects to use the family measures as covariates or as grouping variables in order to perform subgroup analyses.

Conclusions

The analyses presented here must be regarded as only preliminary. It is clear from the analyses of the demographic data of the overall group that random assignment is working well to assure a balance of characteristics in the groups. Unfortunately, as it has currently worked out, the subgroup of children on whom we currently have one year followup data is very skewed, with significantly more complications in the early intervention group. Given this skewness, it is not suprising that there are trends towards better performance in the nonintervention group. These trends however are moderated by the application of the pretest BDI scores as covariates, which provides evidence that the differences are related to the imbalance in the number of complications in the groups.

Because the overall group shows a better balance in its demographic characteristics, it is expected that the more thorough analyses that will be available next year will provide interesting and useful results which could not be derived from the current data set.

Future Plans

In addition to the measures reported here, several other measures are being taken on those infants currently enrolled when they are posttested. An additional measure taken at 12 months corrected age is the Minnesota Child Development Inventory (MCDI). Also, at 12 months corrected age, videotapes of mother-infant interaction and of infant motor development are completed by a trained child development specialist or a licensed physical therapist. Parents are paid a $10 incentive for videotaping.

The videotape of motor functioning follows a specific script. The child performs the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape involves the parent and child in play activities. In the first section, the mother and child play together for 15 minutes "as they would at home." Then for one minute the parent encourages the child to put the toys away. For the next two minutes, the parent reads to the child. Then the parent leaves the room for 45 seconds, and taping continues for two minutes after the parent returns to the room.

Finally, the parents are asked to complete the Carey Infant Temperament Scale which assessed the parents' perceptions of the infant's temperament. Scoring categorizes the infant into easy, intermediate, slow-to-warm, and difficult categories. This information will be compared with the ratings of the videotaped parent/child interaction to determine if the child's temperament affects interactions with the parent.

At this point, not enough infants have received these measures at the first posttest to make meaningful comparisons between the groups. The results of comparisons on these measures will be reported next year.

COLUMBUS MEDICALLY FRAGILE PROJECT
Project #10

COMPARISON: Infants with Bronchopulmonary Dysplasia (BPD) or neurologic damage--Coordinated comprehensive services beginning one month prior to hospital discharge vs. services begun at 3 years of age.

LOCAL CONTACT PERSONS: Deborah Cochran, Columbus Children's Hospital
Nancy Hansen, Columbus Children's Hospital

EIRI COORDINATOR: Nancy Immel

LOCATION: Columbus, Ohio

DATE OF REPORT: 10-8-1988

Rationale for the Study

Although significant advances in perinatal and neonatal care over the last decade have improved the outlook for the extremely premature infant, this group of infants still accounts for 50% of the neonatal mortality rate, and the surviving very low birthweight infants contribute significantly to the population of children with multiple disabilities (McCormick, 1985; Raju, 1986). One of the strongest predictors for multiple handicaps is the presence of chronic pulmonary disease (bronchopulmonary dysplasia) at the time of discharge from the nursery (Escobedo & Gonzales, 1986; Koops, Abman, & Accurso, 1984; O'Brodovich & Millins, 1985).

Bronchopulmonary dysplasia (BPD) is a unique disorder of the newborn infant who requires mechanical ventilation and oxygen therapy at birth (O'Brodovich & Millins, 1985). BPD has become increasingly frequent as smaller and smaller infants survive, and affects up to 40% of surviving infants weighing less than 1500 g at birth (Escobedo & Gonzalez, 1986). Although BPD is a severe disabling disorder, it differs from other forms of chronic lung disease in that many affected infants demonstrate substantial improvement and recovery of lung function over the first few years of life. However, despite the encouraging improvement in pulmonary status, up to 40% of these infants have other major handicaps (Koops et al., 1984). The most frequent handicaps include growth failure, developmental delays, neurologic insults, visual problems, and deafness (Koops et al., 1984). The infant with BPD continues to manifest developmental delays well into the third and fourth years of life (Mayes et al., 1983; Meisels et al., 1986).

The etiology of the developmental delays observed in these infants is usually multifactorial and may be related to inadequate nutrition during a critical period of brain growth and differentiation. In addition to demonstrating developmental delays, these infants have substantial health problems beyond the neonatal period, and up to 30% are re-hospitalized during infancy (Hack et al., 1983; McCormick et al., 1980).

Another predictor for neurodevelopmental delay in premature low birthweight children is the presence of Grade III or IV intraventricular hemorrhage (IVH). Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of children who had experienced severe IVH demonstrated moderate to severe handicapping conditions by age three.

Recent advances have been made in the early identification of brain insults which predict later neurologic impairment in this group of infants. It is now routine to monitor preterm infants for intracranial bleeding with the non-invasive cranial ultrasound, and it is possible to identify infants in the first few months of life who are at extremely high risk for later neurodevelopmental delays on the basis of structural brain damage.

Nationally regionalized perinatal care and medical advances have dramatically improved the short-term outlook for the critically ill newborn. However, most of the gain in expertise and knowledge is based in the tertiary care hospital and is not available to the infant, family, or local health, social service, and early intervention personnel following hospital discharge. Consequently, many local primary care physicians and public health nurses are uncomfortable supervising and directing the care of these complex children, and families that live two to three hours from the tertiary care hospital have difficulty accessing adequate local medical care. The resulting fragmentation of health care with multiple visits to multiple specialists at often geographically distant tertiary care centers is cited by parents as a main problem in caring for their chronically ill children.

Added to the problem of inadequate local health care resources, families may find that local early intervention personnel are not trained in the specialized medical, educational, and social needs of medically fragile infants and families, and that home-based intervention delivery may not be available as a service option.

Evidence suggests that regionalization of care to the home and community is an effective means of improving the functional status of the medically fragile infant. Several studies have successfully utilized home-based intervention programs to either facilitate early discharge from the hospital or to facilitate developmental progress in low birthweight infants. Recent reviews of the literature concerning preventive intervention studies indicate that such programs generally have an immediate positive effect, despite the fact that most programs have not been comprehensive in terms of family functioning, quality of life for the child and family, or social competence of the child (Bennett, 1987).

Philosophical and Theoretical Rationale for the Services

The theoretical model upon which the intervention services will be developed, delivered, and evaluated is the biosystems model of development (Cochran & Shearer, 1984). This theoretical approach was chosen because it takes into account the multitude of factors which impact on the growth and development of the critically ill infant. A schematic of this model is presented in Figure 1.

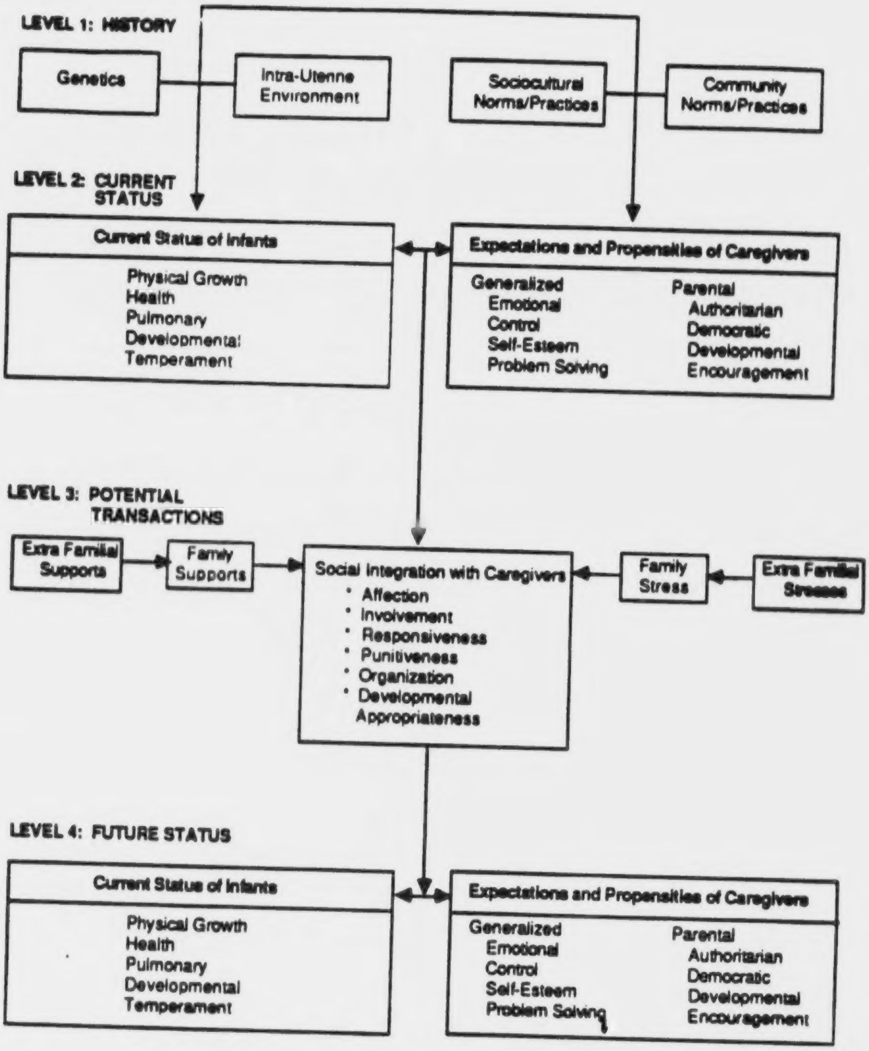
LEVEL 1: HISTORY
Genetics
Intra-Utenne Environment
Sociocultural Norms/Practices
Community Norms/Practices
LEVEL 2: CURRENT STATUS
Current Status of Infants
Physical Growth
Health
Pulmonary
Developmental
Temperament
Expectations and Propensities of Caregivers
Generalized
Emotional
Control
Self-Esteem
Problem Solving
Parental
Authoritarian
Democratic
Developmental
Encouragement
LEVEL 3: POTENTIAL TRANSACTIONS
Extra Familial Supports
Family Supports
Social Integration with Caregivers
• Affection
• Involvement
• Responsiveness
• Punitiveness
• Organization
• Developmental Appropriateness
Family Stress
Extra Familial Stresses
LEVEL 4: FUTURE STATUS
Current Status of Infants
Physical Growth
Health
Pulmonary
Developmental
Temperament
Expectations and Propensities of Caregivers
Generalized
Emotional
Control
Self-Esteem
Problem Solving
Parental
Authoritarian
Democratic
Developmental
Encouragement

Figure 10.1. A Biosocial Systems Model for Differential Development

This model allows for the longitudinal assessment of the infant, the caretaker, the environment, and the stresses and supports which influence transactions between the infant and his family, which in turn regulates future outcomes and status of infants and their families. The model assumes that the "development of young children and their families is a process characterized by reciprocal influence and mutual regulation, and is, therefore, a product of multiple causes operating at different levels of analysis" (Ramey et al., 1984).

There are four levels in this model: (1) the biologic and social histories of the infant and caregivers, (2) the current status of the individual family members, (3) the transactions which occur within the family and between individuals and forces (stresses and supports) outside the family, and (4) the future status of family members and their relationships. These four levels relate to the levels of training, assessment,and intervention addressed by this model.

Because the intervention begins after the infant's birth, the historical factors pertaining to the individual infant and family cannot be manipulated within the context of the collaborative family-oriented interventions. However, the training component of the model is designed to impact on these areas by influencing local community norms and practices. The proposed intervention model is designed to impact on the remaining three levels (i.e, the current status, potential transactions, and future status of the infant and its family). Provision of services based on this model is, therefore, designed to be comprehensive and family-focused.

The Columbus Medically Fragile Program will serve as a model for specialized care and support to the home and community following hospital discharge of the infant, rather than basing this support in the tertiary care hospital. The medically fragile infant is at established risk for developmental delays due to the serious long-term medical and nutrition problems, the lack of coordinated follow-up and intervention services in the local area, and the lack of specialized training for local health, social service, and educational intervention personnel. Therefore, there is a documented need for a collaborative intervention/training model to implement the transition and regionalization of service from the tertiary care hospital to the local intervention systems.

Overview of Study

This study will compare the effects of a coordinated and comprehensive system of early intervention services initiated prior to three years of age with the effects of comprehensive services initiated at age three. One group of infants, the early intervention group, will receive coordinated services to facilitate the transition of their care from a centralized source, the Columbus Children's Hospital, to a regionalized source, agencies within their local communities. The delayed intervention group will receive only the centralized services currently available to CCH NICU graduates. The current level of services for children in this group have been described by Koops, Abman, and Accurso (1984). These services include medical follow-up and management, developmental evaluation, and referral through the hospital follow-up clinic. At age three, children in both groups will be referred for comparable preschool services.

Methods

The Columbus Medically Fragile Project is a cooperative research effort with the "Transition from the Hospital to the Home and Community for the Infant with Chronic Medical Disabilities: Promoting Collaborative Regionalized Care Project," an HCEEP Demonstration Project of the Columbus Children's Hospital (CCH) in Columbus, Ohio. The project will serve 40 graduates of CCH's newborn intensive care unit (NICU) and their families who live in Ohio's Perinatal Region IV. This region encompasses 33 counties in the mid- and southeastern sections of the state. The area is primarily rural, although it includes the urban center of Columbus.

The Columbus project is currently completing the first year of a three-year funding period. Year 1 has been devoted to model development and has focused on three objectives. The first objective has been to establish collaborative intervention teams to service medically fragile infants and their families in Perinatal Region IV. To meet this objective, local administrators of health, social service, and education/early intervention agencies have entered into collaborative agreements with the HCEEP project, and local intervention personnel have been identified to provide services.

The second objective has been to construct an intervention and service delivery model which utilizes the following multiple assessment factors: current status of infants and their caregivers, stresses on the family and extra-familial systems, and the availability and use of family and extra-familial supports. Assessment and intervention protocols have been developed and compiled to assess health and nutritional status, developmental status, parent-child interaction, home environmental factors, and family stresses and needed supports. The measures that will be utilized to assess infant and family characteristics are described in further detail in the data collection section of this paper.

The final objective for the project's first year, training local collaborative intervention teams in the family-focused, home-based intervention model, is currently in progress. In addition to orienting the collaborative intervention teams to the model, a series of multidisciplinary workshops, focusing on the medical, educational, and psychosocial needs of these infants and their families will be held for all team members to promote collaborative case management, and continuity and transition of services.

Subjects

It is expected that a total of 40 medically fragile infants and their families will be enrolled in the Columbus project between October 1, 1988, and September 30, 1989.

Recruitment. Medically at-risk infants who are hospitalized in the Columbus Children's Hospital Intensive Care Unit will be eligible to participate in the study if they have been diagnosed with moderate to severe bronchopulmonary dysplasia (BPD) and have a need for oxygen therapy and/or two or more pulmonary medications on discharge. Infants with neurologic damage (severe [Grade IV] perinatal intraventricular hemorrhage, hydrocephalus, or microcephaly) requiring specialized equipment; i.e., feeding pumps, suction, and/or aerosol equipment will also be eligible.

Eligible infants will be identified for inclusion in the study when their weight reaches 1500 g (approximately one month before discharge). At that time, the parents will be contacted by the project's clinical nurse specialist. The nurse will explain to the parents the nature of the study, request their participation, and if parents are willing, obtain informed consent. If parents decide not to participate in the study, their infant will receive routine medical and developmental follow-up through the Neonatal Follow-up Clinic, and, if necessary, will be referred for health, occupational therapy, physical therapy, and early intervention services until the age of three. Preschool services for children with handicaps will be available through the local school district when the child becomes 3 years old. Parents will be informed of their child's group assignment after they have completed the informed consent procedure.

Assignment to groups. Infants will be enrolled in the study continuously between October 1, 1988, and September 30, 1989. Following enrollment, the infants will be randomly assigned to either the early or late intervention groups after being stratified by their primary diagnosis of BPD or neurologic damage. The BPD and neurologic groups will each be further stratified into groups of more or less severe illness based on a severity index developed by the project co-director, Nancy Hansen, M.D. Group assignments will be controlled by the EIRI site coordinator, who will be unknown to the infants and their families.

Demographic characteristics. It is anticipated that during the year, 40 infants will be enrolled. Because enrollment has not yet begun, actual demographic data is not available. However, it is expected that the infants will be primarily Caucasian and at least 50% will come from rural, lower income families.

Intervention Programs

The Columbus Medically Fragile Study will compare an early intervention to a later intervention program. Children in both groups will receive medical follow-up after their initial discharge from the ICU, and, if needed, will be referred for preschool services through the public school system or MR/DD programs (mental retardation/developmental disabilities) when they reach age three. The early intervention group will also receive coordinated and comprehensive local services designed to improve their health and developmental outcome, and to ease their transition from the tertiary hospitals to the local community. The later group will receive referrals to all indicated services identified at follow-up clinic visits.

Early intervention program. Intervention services provided to the early intervention group will consist of pre-discharge hospital visits, medical follow-up clinic services, coordinated multidisciplinary home-based early intervention services, and preschool services as needed. The intervention will begin with two to three weekly hospital-based visits with families one month prior to the infant's discharge from the NICU.

After hospital discharge, infants will receive regular medical supervision and developmental evaluation through Columbus Children's Hospital High-Risk Neonatal Follow-up Clinic. The first follow-up visit will occur two weeks post-discharge. Additional visits will be scheduled for 6, 12, 18, and 24 months of age (corrected for prematurity), and yearly thereafter. The clinic is staffed by a neonatologist, a social worker, a nurse coordinator, and an occupational therapist who provide health monitoring and developmental evaluation. Full ancillary services (radiology, drug level monitoring, pharmacy, respiratory therapy, ophthalmology, and audiology) are available in the hospital complex.

Regular home visits will also begin following hospital discharge and will continue until the child reaches 24 months of age. The home visits will be carried out by local service providers in conjunction with the CCH project staff clinical nurse or parent-infant educator. It is anticipated that the initial home visits will be conducted by local public health nurses who will be available to help parents adjust to the needs of a medically fragile infant and to coordinate information and services between local health care providers and the hospital.

As the infant's medical condition stabilizes within the home environment, the local early interventionists will conduct cooperative home visits in conjunction with the CCH parent-infant educator. These service providers will utilize the Family-Focused Intervention Model and the process components (establishing baseline, modeling, parent feedback, and recording) of the Portage (Cochran & Shearer, 1984) model for home teaching. While training will be provided in the use of the Partners for Learning Curriculum (Sparling & Lewis, 1984), local service providers will be free to utilize their current curriculum or any other curriculum to best meet families' needs. It is expected that one to three activities in the areas of health, handling, nutrition, education/intervention, interaction, community support, and resource retrieval will be planned for the infant and/or family members. The activities will be prepared in a written plan. Local service providers will also be encouraged to assist families in locating and utilizing additional community services such as consulting or respite care. The amount and intensity of training through cooperative home visits and resource provision to local service providers by the CCH project staff will be decreased as the local service providers develop their professional skills and community support systems to assist the infants and their families. The ultimate goal of the project is to transfer full responsibility for the care of the medically fragile infant to local service providers (physicians, public health nurses, early educators, etc.). It is anticipated that these agencies will continue to provide necessary services after the children reach 24 months of age and are no longer involved in this project.

At three years of age, early intervention services will be available through the local school districts or in county mental retardation and developmental disabilities programs. It is anticipated that developmentally appropriate preschool services will be provided in the least restrictive environment according to an approved IEP (individualized education plan).

Delayed intervention group. Infants in the delayed intervention group will receive the services that are currently available to graduates of the NICU. These services include the same medical and developmental follow-up services of the High-Risk Neonatal Follow-up Clinic that the early intervention group will receive. However, they will not receive the coordinated community early intervention services that will be available to the early intervention group. Infants in the delayed intervention group who are found to be delayed, at-risk for delay, or in need of community services by the follow-up clinic, will be referred to appropriate community agencies by the hospital follow-up clinic. These agencies will be notified of the referral. Based on past experience, referral agencies have been utilized inconsistently at best. At age three, children in the delayed intervention group will also be eligible for preschool services for handicapped children if they meet entrance criteria at that time.

Treatment verification. Treatment verification procedures will be carried out to ensure that treatment occurs in accordance with the proposed intervention program plan. It will consist of data collected on the child, family, and intervention program.

Treatment verification data on children in the early intervention group will include the Individualized Family Service Plan (IFSP), a log of individual services provided, and attendance records. This data will be collected and recorded by the local service provider and transition support staff. A statement of additional services will be collected from parents of children in both groups at posttest time.

Data on the family will include an estimate of the quality of parent involvement by CCH project staff, a parent satisfaction questionnaire completed by parents at posttest, a record of parent time spent working on child's programs collected by the local service provider, and parent telephone interviews conducted by EIRI staff.

Treatment verification information will also be gathered on the intervention program itself. CCH project staff will evaluate the quality of the local service staff. EIRI staff will maintain weekly telephone contact with CCH project staff, conduct two yearly site visits, and an annual onsite evaluation.

Cost of alternative interventions. The cost of the early vs. later intervention programs will be determined by the total cost of the infant's hospital charges, personnel, consultant, parent volunteer, facilities, equipment, and transportation costs for each group. Per child costs will be determined by dividing the total cost per group by the number of infants in that group.

Data Collection

Data collected at the Columbus project will include both the results of outcome measures being used across all EIRI sites and measures that are specific to this study. The outcome measures will include assessments of both child and family functioning. Pretest data will be collected at 2 weeks post discharge from the NICU, and posttest data will be collected at 6, 12, 18, and 24 months corrected age.

Recruitment, training, and monitoring of diagnosticians. In June 1988, six diagnosticians were trained by the EIRI Evaluation Specialist to administer the Battelle Developmental Inventory. Five of the diagnosticians are Registered Occupational Therapists currently employed in the Occupational Therapy Department of Columbus Children's Hospital. The sixth diagnostician is an Early Childhood Specialist currently employed in the Child Life Department of Columbus Children's Hospital. While their work assignments involve in-patient and out-patient care, none of the therapists is assigned to the NICU or the Neonatal Follow-up Clinic. They will evaluate the subjects as a part of their regular employment; however, they are, and will remain, uninformed as to the purpose of the study and to the group assignment of the infants.

Prior to the formal BDI training, the diagnosticians were required to become familiar with the BDI through a review of the test manuals, practice in scoring, viewing of a videotape of test administration procedures, and completing a self-mastery test. Currently, the diagnosticians are completing three practice BDI administrations. The third practice session completed by each diagnostician will be reviewed by the EIRI Assessment Specialist who will then certify the diagnostician. In each year following certification, 10% of each diagnostician's test administrations will be shadow scored for reliability by the onsite assessment coordinator. The assessment coordinator will also be responsible for tracking and scheduling evaluations for each subject. The hospital social worker assigned to the Neonatal Follow-up Clinic has been trained to administer the demographic survey and the measures of family functioning. A more in depth discussion of test administration procedures is available in the EIRI 1986-87 annual report.

Pretesting. Two weeks following discharge from the NICU, all infants in the study will be scheduled for the first visit to the Neonatal Follow-up Clinic, where their health status, growth, pulmonary function, and rehospitalization record will be evaluated. At that time, infant assessments will also include the BDI and the Infant Neurological International Battery (the Infanib), a measure of muscle tone and reflex development in the newborn and infant. The Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness of the family members to the family; the Family Support Scale (FSS), a measure of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available to the family, the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the past 12 months, and the Parent Survey (demographic information) will be completed by the parents. Parents will be paid $20 for completing the outcome measures. All tests and questionnaires will be returned to EIRI for scoring, data entry,and storage.

Posttests. Posttests will be scheduled when the infants are 6, 12, 18, and 24 months (ages corrected for prematurity). At the posttest sessions, infants and their parents will again complete the pretest battery. In addition, parents will complete the Parent Satisfaction Survey and the Report of Child Health. Additional services form will be completed during an interview with the social worker.

At the 6, 12, and 24 month posttests, parents and infants will be videotaped during a scripted 16-minute period which will include free play and structured activities. The videotapes will be coded and used as an outcome measure.

Data analysis will be carried out to compare the various infant/parent family outcome measures. There will be five points when data is collected on the outcome measures for each of the two groups (2 weeks post-discharge, 6, 12, 18, and 24 months of age) during the grant period. Data collection will continue following the grant period to collect additional data points up to 60 months (36, 48, and 60). Each dependent variable will be entered into the proper cell and analyzed by a 2 (group) x 5 (time) mixed measures ANOVA. Where dependent variables are conceptually related, a MANOVA will be used. To clarify where significant differences lie, Neuman Keuls post hoc comparison tests will be used on significant dependent variables.

Numerous interrelationships affect the variables which will be used in this study. To examine functional interrelationships, a variety of correlational analysis will be performed.

NEW ORLEANS ASSOCIATION FOR RETARDED CITIZENS

Project #12

COMPARISON: Severely Handicapped Infants -- Center-based developmental intervention delivered by paraprofessionals trained through an inservice model vs. the center-based developmental intervention delivered by paraprofessionals trained through an intensive, in-classroom model.

LOCAL CONTACT PERSON: Patricia Welge, Project Coordinator, Human Development Center, Louisiana State University Medical Center

EIRI COORDINATOR: Mark Innocenti

LOCATION: New Orleans, Louisiana

DATE OF THE REPORT: 10-8-1988

Rationale for the Study

There is a chronic and critical shortage of certified personnel in early childhood special education (McLaughlin, Smith-Davis, & Burke, 1986). This shortage is especially acute in rural and inner-city areas (Huntington, 1988; McLaughlin et al., 1986). With the passage of P.L. 99-457, this shortage will likely increase as early childhood intervention programs grow to provide services to a greater number of children. At present, partly as a result of this shortage, it is not uncommon to have noncertified personnel providing services to young children who are handicapped (Huntington, 1982; Teaching Resources, 1985; Weiner & Koppelman, 1987). The possibility of using noncertified individuals, supervised by appropriately trained and certified/licensed personnel, as interventionists in early childhood programs has been discussed as an appropriate and feasible strategy (Innocenti & White, 1988; Peters & Deiner, 1987). A question raised by this personnel strategy is what levels of training and support are required for these noncertified individuals to deliver effective services (Peters & Deiner, 1987). A number of projects have developed training procedures for noncertified personnel and have presented evidence for the effectiveness of their training procedures (e.g., Fredericks, Baldwin, Moore, Templeman, & Anderson, 1980; Guess, Smith, & Ensminger, 1971; Shearer & Shearer, 1972). The purpose of this study was to determine whether the addition of systematic training, ongoing technical support and assistance, and expanded materials and equipment to a program that used noncertified personnel as interventionists would result in enhanced child growth and improved family functioning when compared with the inservice model already in use to train the noncertified personnel.

Review of Related Research

For the purposes of this report, noncertified personnel will be referred to as paraprofessionals and defined as any individual, including those with a university degree and/or formal certification, who is providing services to a child in an area that he/she is not specifically certified (Pezzino, 1984). Research on the effectiveness of paraprofessionals has demonstrated that paraprofessionals can teach new skills to handicapped children (Fredericks et al., 1980; Guess, Smith, & Ensminger, 1971; Phillips, Liebert, & Poulos, 1973; Schortinghais & Frohman, 1974; Shearer & Shearer, 1972). A difficulty with the majority of this research is that intervention vs. no intervention was compared, and, therefore, it is difficult to determine whether paraprofessional training procedures result in intervention that is any better for children and families than what they would have received in the absence of special training to the paraprofessional.

The most commonly used training procedures for paraprofessionals consists of orientations and inservice sessions (Frith & Lindsey, 1982). Research studies investigating these common approaches generally provide information only on changes in teacher knowledge and attitudes (Farrell, 1982; Johnson & Ferryman, 1969). Information that has been presented on teacher behavior as a result of this inservice, classroom-type training has not been positive (Farrell, 1982). Data on how these teacher changes affect children they are working with is usually not presented.

An alternative to this inservice training model for paraprofessionals is the therapy or collaborative consultant model (Striefel & Cadez, 1983). With this model, a certified professional provides the assessment of the handicapped child and outlines the programming to be given. The professional trains the paraprofessional in the implementation of a program and in data collection practices until the paraprofessional meets a specified criteria. The paraprofessional then takes over the program. The professional makes regular contacts with the paraprofessional to observe the implementation of the program, provide feedback (and retraining if necessary), check the program data, and make program changes as needed.

A variation of the therapy consultant model was used by the Social Integration Project (SIP) to provide services to children who were handicapped and were placed in an integrated day care center where the primary teaching staff were paraprofessionals (Rule, Killoran, Stowitschek, Innocenti, & Striefel, 1985; Rule et al., 1987). Handicapped children in the SIP demonstrated significant skill increases while in the program, and paraprofessional attitudes were positive toward the program (Rule et al., 1987). In addition, children in the SIP program were compared to matched children in a professionally staffed intervention program (Rule et al., 1987). Results indicated no difference between programs on measures of child functioning.

The results of the studies reviewed above suggest that paraprofessionals can be effective intervention agents. A variety of training procedures for paraprofessionals have resulted in children making development gains, but comparative studies of different training procedures are rare. A comparative study of a paraprofessional versus a professional implemented intervention program found no difference in child functioning (Rule et al., 1987). Unfortunately, this study was confounded in that the paraprofessionally implemented program was mainstreamed and the other was not, children were matched and not randomly assigned to groups, and the size of the subject sample was small.

The current study will partially replicate the Rule et al. (1987) study while avoiding some of the confounds they encountered. Random assignment was used to assign subjects to groups, and a larger subject sample was employed. Another difference from the Rule et al. study is that this study compared the effect of two different methods of training paraprofessionals (variation of the consultant versus the inservice model) on child and family functioning. A final difference is that this research occurred in an inner-city intervention program, an identified personnel shortage area (McLaughlin et al., 1986), rather than a suburban setting.

Overview of Study

This study will contrast two types of paraprofessional training in a center-based service program. The Association for Retarded Citizens (ARC) in New Orleans currently provides center-based developmental intervention services for handicapped children from birth to 3 years of age. The ARC provides services in an inner-city area and uses paraprofessional staff to implement the program. These staff were traditionally trained through monthly inservice sessions and had almost no supervision or contact with professional personnel. The ARC was separated into two programs for this study. One program carried on without change (basic program). In this program, staff continued to receive monthly inservice sessions. The other program was augmented (augmented program) through training from professionals using a variation of the therapy consultant model. Training for the augmented program focused on increasing the structure of the program by teaching systematic intervention strategies, by providing ongoing technical assistance and support, and by providing expanded materials and equipment. Results of this study will provide information on the effect of these different training procedures on intervention success as measured by child and family functioning; cost effectiveness data was also obtained.

These results will be important in that: (a) Although the primary focus was on child growth, benefits to the family were possible, and measures of family functioning were obtained. Family functioning has been an overlooked area of early intervention research in the past (Casto & Mastropieri, 1986; Dunst, 1985). (b) Under P.L. 99-457, many programs will have to engage in training and certification of some type with their noncertified personnel to come into compliance with the law (Innocenti & White, 1988; Peters & Deiner, 1987). Knowledge regarding the efficacy of various training methods will be needed. (c) The ARC program is not atypical of what now exists in many rural and inner-city programs (Huntington, 1988; Teaching Resources, 1985). Cost effectiveness data from different approaches will be important for making administrative decisions.

Methods

This study was conducted through the New Orleans Association for Retarded Citizens (ARC). The ARC is a nonprofit United Way agency and is affiliated with both the National ARC and Louisiana ARC. The ARC is governed by a board of directors composed of experts in the field of education for the handicapped, consumers of the services, and people in the community. The ARC receives funding from United Way and the Louisiana Office of Mental Retardation and Developmental Disabilities. The ARC is the largest provider of services to children with handicaps who are from birth to 3 years of age in the greater New Orleans area. The ARC operates three centers to provide services to children (the Main, Jefferson, and West Bank sites) and operates a work activities center for adults with handicaps at the Main site. The ARC provides advocacy services for the handicapped, parent training services, and operates an information cooperative. The ARC offered the participation of all their sites for this research study. The ARC offers a 5-day-per-week, center-based program that operates from 9:00 a.m. to 3:00 p.m. for all handicapped children in their cachment area.

Interventions studied as a part of this project occurred over a 2-year period; the 1986/87 and 1987/88 academic years. During the first year, two classrooms at the Jefferson and West Bank sites and three classrooms at the Main site participated in the research. Teachers were randomly assigned at each site to either a basic or augmented classroom (two basic classes at the Main site). During the second year, only two of the sites (Main and West Bank) participated in the research due to some internal changes at the ARC. Six classrooms from these two sites participated (four classrooms at Main). Classrooms remained in the basic or augmented group dependent on the teacher's previous year assignment. The classroom and teacher new to the study at the Main site was designated an augmented classroom.

Due to delays in starting the research program, the first year of intervention was 6 months in length. The study began late in January 1987 and continued to August 1987. The second year of intervention coincided with the traditional academic year, from September 1987 to May 1988 (9 months).

Subjects. Subjects will be described according to time of enrollment (see Table 12.1). Forty-five (24 basic, 21 augmented) children between 10 and 34 months of age (mean = 23.7) participated in the first year of the study. Twenty-five of these subjects were male. Of these 45 subjects, 29 "graduated" to preschool programs run by the local school districts. Sixteen subjects continued at the ARC. Of these 16, 2 augmented subjects at the Jefferson site were placed, in their second year, in a basic classroom. The remaining 14 (8 basic, 6 augmented) continued in classrooms of their assigned group. Of these 14 (8 males), the ages at program entry ranged from 12 to 22 months (mean = 16.1).

During the second year, 19 new subjects (8 basic, 11 augmented) began participation in the research. Ages of these subjects ranged from 12 to 32 months (mean = 23.0). Ten of these subjects were male.

Table 12.1

Number of Subjects and Group Placement by Year for the ARC Paraprofessional Training Study

	Academic Year	
n	1986/87	1987/88
8	Augmented Group	"Graduated" to public school
11	Augmented Group	Augmented Group
2	Augmented Group	Basic Group
16	Basic Group	"Graduated" to public school
8	Basic Group	Basic Group
11		Augmented Group
8		Basic Group
Total: 64		

The primary analyses for this report are on subjects that have received 1 year of intervention; that is, all subjects from the 1986/87 year and all newly enrolled subjects from the 1987/88 year. This cohort consists of 64 subjects (32 basic, 32 augmented) ranging in age from 10 to 34 months (mean = 23.3) when they began intervention. Thirty-five were male.

Recruitment. The criterion the ARC uses to identify a child as handicapped has been established by the Louisiana Office of Mental Retardation and Developmental Disabilities. This criteria qualifies a child as handicapped if he/she exhibits a mild delay in two or more developmental areas, a severe delay in one or more developmental area, or has a condition diagnosed by a physician that may lead to life-long developmental delays. The majority of children identified for service at the ARC have more involved handicaps.

All children and their families who were identified as handicapped and were scheduled to participate in the ARC program were considered for inclusion in the study. Services at the ARC were provided on a first come, first serve basis until all slots were filled. From this pool, subjects were included in the study based upon parents' willingness to participate prior to knowing which treatment group they would be assigned. Modifications were made in this procedure during the second year due to the Jefferson site not being available for the study. Parents at all three sites were initially informed of the study, but parents of children at Jefferson were later informed they could not participate. Informed consent to participate in this study was obtained from the parents. Parent failure to provide informed consent did not exclude a child from receiving services at the ARC.

Assignment to groups. Random assignment of teachers to classes (discussed earlier) was accomplished with coded information so that knowledge of which teacher was associated with which class was not known during subject assignment. The children at each site were categorized by 6-month age groupings. Independently, another set of researchers, who were familiar with the children's handicapping conditions, categorized children into three functional levels ranging from least to most impaired. Based on these categorizations, children were paired by functional level within age category (a 6 x 3 matrix). If pairings were not possible using this procedure, children within the same age categories were paired with children in an adjacent functional level category. If that procedure was not possible, children within the same functional level categories were paired within adjacent age categories. After all pairings were accomplished, a random procedure (coin toss) was implemented to assign one member of each pair to the basic condition and the corresponding pair member to the augmented condition.

During the second year, a similar procedure was followed. At each site, an age by functioning matrix was developed. This resulted in a 4 x 3 matrix, as only one child (a 12-month-old) was in the 0- to 12-month age range, and the 13- to 18-month grouping was expanded to include this subject. Subjects continuing from the first year were placed, in the matrix, in their assigned groups. The remaining subjects were randomly assigned, by a coin toss, to complete matrix pairings.

Attrition. In the first year, 54 subjects were recruited to participate in the study and were pretested. During a period between pretesting and the start of intervention, eight subjects dropped from the study. These subjects had been prematurely enrolled in the ARC program. Evaluation revealed that these subjects were not qualified to receive services at the ARC (i.e., did not exhibit a handicapping condition), and they were required to leave the ARC program per Louisianna state guidelines. Another child moved from the area during intervention and transferred to another program.

Twenty-nine subjects were pretested at the beginning of the second year. Six of these subjects were at the Jefferson site, which did not become involved in the research due to administrative decisions. Four subjects (two basic, two control) began intervention but withdrew from the study during the year. These subjects withdrew from all ARC program participation due to individual family problems.

Demographic characteristics. The subject pool for this research study is complete. The ARC is altering its service delivery patterns for the 1988/89 academic year. Further research efforts with ARC subjects will involve the continued collection of child and family functioning data on an annual basis.

The majority of subjects served by the ARC exhibit moderate to severe handicaps. The mean developmental quotient of subjects at program entry was 46.9, with a standard deviation of 24.8. Approximately 75% of children's handicaps are from organic and chromosomal impairments, with one-third being multiply involved.

Approximately 72% of the subjects are Black. The majority come from low SES families, and over half the families receive some form of public assistance. Approximately 45% of subjects come from families where both the mother and father live at home.

Demographic characteristics for all children in the research are presented by group placement in Table 12.2. These subjects include all those enrolled during the 1986/87 year and newly enrolled subjects during the 1987/88 year. This table contains information on the comparability of groups. Probability values were obtained from t-tests. The groups were comparable on 16 of 18 demographic characteristics. The two characteristics where inequities existed were in the percent of subjects with both parents living at home (intact families) and in the percent of families who receive public assistance.

A larger percentage of subjects in the augmented condition have intact families where more families of basic group subjects receive some form of public assistance. The effect of these discrepancies on developmental functioning is not known. Public assistance may be beneficial in that it would help ensure more adequate food and housing for families, offsetting any potential income inequities. Neither of these two demographic characteristics were significantly correlated with child outcome measures from the Battelle Developmental Inventory. It should be noted that some concerns regarding parent report data have been raised by site staff. Parents in this study come primarily from low-income areas, and some attempts at providing information that meet parent expectations of what the site staff would like to see, rather than actual information, may be occurring to some degree. Demographic questions related to income, occupation, and other potentially "sensitive" variables were left unanswered by many parents. Also, in families where both parents were not living at home, information on fathers was not obtained.

Table 12.2

Comparison of Groups on Demographic Characteristics for ARC Paraprofessional Training Study

Variable	Basic			Augmented			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age of child in months at pretest	23.7	(6.5)	32	23.0	(7.2)	32	.70
• Age of mother in years at pretest	27.6	(7.4)	32	29.6	(7.3)	32	.30
• Age of father in years at pretest	30.4	(6.2)	27	33.6	(7.8)	26	.11
• Percent Male*	53.1		32	56.3		32	.81
• Years of Education for Mother	11.9	(2.1)	32	12.6	(1.9)	32	.22
• Years of Education for Father	12.2	(1.8)	28	12.8	(2.4)	24	.30
• Percent with both parents living at home	31.3		32	53.1		32	.08
• Percent of children who are caucasian*	18.8		32	37.5		32	.10
• Hours per week mother employed	12.4	(18.5)	28	9.7	(16.7)	30	.56
• Hours per week father employed	39.6	(9.6)	17	41.8	(18.1)	16	.67
• Percent of mothers employed as technical managerial or above*	10.0		30	22.6		31	.19
• Percent of fathers employed as technical managerial or above*	27.3		22	20.0		20	.59
• Total household income	$9,718	(19,458)	16	$14,555	(21,009)	18	.49
• Percent receiving public assistance	65.6		32	43.8		32	.08
• Percent with mother as primary caregiver*	90.9		22	92.3		26	.87
• Percent of children in day care more than 5 hours per week*	59.4		32	71.0		31	.34
• Number of siblings	1.2	(1.4)	32	0.9	(0.9)	32	.33
• Percent with English as primary language	100		31	96.9		32	

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

Intervention Programs

For young children who are developmentally delayed, the ARC currently offers two types of early intervention programs: (a) 5-day-per-week, center-based program that operates from 9:00 a.m. to 3:00 p.m.; and (b) an infant service program that provides 1 hour of intervention per week to infants with handicaps and their families at one of the three ARC sites. All children involved with the EIRI research were in the center-based program.

In the center-based program, the typical classroom organization contains eight children served by a teacher and aide. The majority of teachers and aides are paraprofessionals, with few having a bachelor's degree and none having teacher's certification in early intervention. Prior to the participation of the ARC in the EIRI research, classroom staff received some training through general, agency-wide inservice sessions. Child goals and objectives were determined by consultants in the areas of speech and language and motor therapy, but these consultants rarely interacted with each other or with the classroom staff. Some instructional activities occurred throughout the course of the day, but the quality and quantity of these activities varied.

The research at the ARC investigated two different methods for training paraprofessional teachers to work effectively with young children who are handicapped. The interventions consisted of a continuation of services as they had been provided in the past (basic condition) where classroom staff received training through monthly inservice sessions. The basic services were augmented in some classrooms through in-classroom training to classroom staff from professional consultants who held a nationally recognized certification (teacher certification, CCC, OTR, etc.) and who had experience in the field of early intervention.

Basic condition. In the basic condition, classroom practices were similar to those that were in effect prior to beginning the study and are similar to those described above. Paraprofessional classroom staff in this group received a series of topical workshops throughout the course of the school year to provide information on a variety of subjects (e.g., child growth and development, handicapping conditions, CPR training, etc.). As described, classroom staff in the basic condition had minimal contact with the professionals who recommend specific goals for children. A multidisciplinary therapy model was used that did not focus on staff communication. Teachers and aides were not trained in the implementation of specific curricula or in the implementation of specific child programs. For staff in the basic condition, no procedures for providing feedback on their child programs or on specific teaching techniques was available.

Children in these classrooms received Individual Habilitation Plans (IHPs) that were developed by the teachers based on the professional recommendations and on a teacher-administered criterion-referenced instrument (Harrison County checklist). Instructional activities, when they occurred, were generally structured in a one-to-one teaching situation format.

Instructional activities occurred throughout the day, but no daily systematic learning plans were available. This created variability in the types and frequency of instruction that occurred within a class and across classrooms. The lack of a systematic strategy resulted in teaching practices that would not be considered "best practice" in special education. For example, instructional activities that were implemented in the basic classes were often not related to child goals, child progress through instructional sequences were often not data based, and appropriate teaching techniques were not consistently applied. Educational materials existed in these classrooms, but were not adequate to meet all child goals.

The teacher for each classroom established a daily schedule where activities were listed by general developmental areas; for example, gross motor time, fine motor time, cognitive time, etc. Activities that occurred during this time were teacher dependent. Some individualized activities occurred, but not systematically. During times when teachers worked individually with a child, no planned activities occurred for the other children.

Augmented condition. The experimental intervention, referred to as the augmented condition, involved the employment of a collaborative consultation model in the classrooms. Subjects attended ARC classrooms, staffed by similarly qualified staff, on the same days and for identical hours as subjects in the basic condition. For classrooms in this condition, the paraprofessional staff received training from professionals in their classroom throughout the school day. Professionals were from an interdisciplinary team from the Louisiana State University (LSU) Human Development Center. The professionals worked with classroom staff two to three times per week helping them to design and implement child specific programs. Professional staff were certified and experienced in infant early intervention.

Classroom staff were directly instructed in the purposes of various child objectives, were taught teaching strategies needed to meet specific objectives, and were provided regular feedback on their teaching techniques. The focus of teaching activities was on teaching children needed skills during naturally occurring classroom routines (i.e., incidental teaching methods during snack, music, free play, etc.; cf., Haring & Innocenti, 1988). Child IHPs were collaboratively developed by classroom staff and professionals. In addition, materials and equipment needed to meet specific child and group goals or for various classroom activities were provided as necessary. This equipment included such items as: (a) adaptive equipment for physically handicapped children; (b) materials for specific programs (such as language cards, adapted bowls and spoons); (c) developmentally appropriate toys, where needed; and (d) additional food items to be used at snack times to aid in the implementation of incidental teaching programs.

Classroom staff in the augmented condition were trained in the use of a specific curriculum (Louisiana Curriculum for Infants with Handicaps) that included activities to meet objectives, as well as in adapting curriculum for specific child needs. The majority of instruction in this condition was provided through group individualized formats. That is, although the children were primarily in group settings, specific child skills were focused on within these settings so that each child received instruction appropriate to his/her skills and needs. The Individualized Curriculum Sequence Model served as a framework for instructional activities.

Treatment Verification

This study and the other EIRI studies have implemented a number of procedures to verify that treatment is being implemented as intended. Table 12.3 presents some of these data. One method to verify that treatment is received is to collect child

Table 12.3

Treatment Verification Data for ARC Paraprofessional Training Study

Variable	Basic			Augmented			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• General health of child [&]	1.9	(0.6)	31	1.9	(0.6)	31	.83
• Percent child attendance	71.1	(21.0)	32	77.9	(12.7)	32	.12
• Parent satisfaction [Δ]	24.1	(3.8)	32	23.4	(3.5)	27	.52
• Teacher rating of parents [#]	6.4	(2.3)	32	7.1	(2.1)	32	.27
• Hours of speech therapy [*]	2.7	(10.3)	29	1.4	(7.6)	28	.58
• Hours of PT/OT therapy [*]	14.9	(52.6)	28	5.5	(12.6)	28	.36

[&] Based on a parent rating of the child's health where: 1 = worse than peers; 2 = same as peers; 3 = better than peers.

[Δ] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[*] Data are based on parent report, obtained at posttest, of child time in the service during the past year.

attendance data. If a child does not attend a program regularly, then evaluating treatment effectiveness is confounded by their absence. Daily records on attendance are kept by ARC staff, and these records are forwarded to EIRI on a monthly basis. In addition to the attendance data, general health data on the children are also being collected. Health factors can potentially effect child progress. No differences were found between the groups on either attendance or health factors (Table 12.3).

Many of the EIRI studies have an extensive treatment verification component that is related to parents. This emphasis on parents is minimized in this study. Parents of subjects are not required to be involved in the child's education except for attendance at one IHP meeting (children are even bussed to and from school). This programs' de-emphasis on parents, along with related demographic factors (i.e., many parents do not have phones, project staff cannot visit federal housing projects for work-related activities, etc.), make obtaining parent report data difficult. Parent satisfaction with the intervention program and a parent report of other services the child may be receiving is obtained annually. These data are presented in Table 12.3. Parents in both groups were equally satisfied with their child's program. Parent report of additional services did not result in the finding of group differences. Although analysis of the raw data suggest that when parents were asked to fill in hours in preschool, it appears many included their child's time at the ARC. This area is not reported for this reason.

Teachers were asked to rate their perceptions of each child's parents as a treatment verification measure. This rating is based on minimal contact between parent and teacher. The ability of teachers to accurately rate parents on minimal, or even extended, contact must be examined with caution. Teachers' ratings of parents at the ARC did not result in group differences (Table 12.3), and most parents were positively rated.

In the second year of the study, parents were also asked to provide an estimate of the time they interacted with their child on developmental activities at home. These data, although not extensive, have not been analyzed for this report.

Site review. An important aspect of treatment verification is the site review. The purpose of this review was to collect information about the nature and quality of early intervention services that are being delivered at the ARC, to verify that the research being conducted by EIRI is being implemented as intended, and to collect needs assessment data that may be useful to site administrators seeking technical assistance.

The first site review was conducted on April 24, 1987. The ARC was found to be complying with EIRI research expectations. Specific areas were reviewed, and clear differences between the basic and augmented conditions were found. For interested readers, greater detail is available in last year's annual report or the copy of the site review report, which is available from EIRI.

The second site review was conducted on April 26 and 27, 1988 (a site review report is available). The process differed for this review in two major respects: (1) The review team included a member not affiliated with EIRI, but a person who was familiar with early intervention practices. This member was David Sexton, Professor of Special Education, University of New Orleans. (2) Instead of treating the ARC as one program, the basic and augmented conditions were evaluated as if they were separate programs.

On an EIRI site review evaluation form, the basic program received 75.3 of a possible 150 points, and the augmented program received 103.7 points of 150. It was clear that the ARC research was being implemented as intended and that there was a substantial difference in the nature of the services being provided in favor of the augmented condition. This fact was represented quantitatively, but qualitative differences in the conditions further emphasized this distinction.

The ARC is doing a competent job with limited resources. The inclusion of procedures used in the augmented condition clearly appeared to have a beneficial impact. Overall, the site review team was in agreement that the augmented condition contained the procedures of choice based on available resources.

Costs of alternative interventions. Difficulties have been encountered in obtaining cost data from the ARC. Cost data for the entire ARC program were recently received. Cost information specific to the augmented condition is being calculated by LSU site staff. These data will be sent to EIRI and combined with the other ARC data to provide cost analysis information. These data should be available in October 1988.

Data Collection

All children were administered the Battelle Developmental Inventory (BDI). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. As a norm referenced measure appropriate for children from birth to age 8, the BDI serves as the primary measure of child development. Test characteristics of the BDI allow valid assessment in a number of developmental domains, and the age range it spans allow for its use in longitudinal research. The BDI was selected for use in the EIRI research based upon the results of an expert panel convened to help determine appropriate measures and is used at all EIRI research sites.

Parents of children in the study complete the following scales of family functioning: Parenting Stress Index (PSI), Family Resource Scale (FRS), and the Family Adaptability and Cohesion Evaluation Scales (FACES). These measures assess, respectively: parent stress, family resources, and functioning of the family in respect to an "ideal" family. Family functioning has been an overlooked area of early intervention research (Casto & Mastropieri, 1986), and, thus, a variety of family functioning instruments were used to detail changes that may occur given different types of early intervention services. These measures will also allow the determination of services that are more beneficial to certain types of families. These family measures and the BDI (core measures) are completed at each test session.

In additon to the core measures, other measures were selected to be used at posttest. These complementary measures were selected to enhance the primary measures for this population and type of intervention. The Early Intervention Developmental Profile (EIDP) and the Interactive Communication Inventory (ICI) were selected as complementary mesures that assess child developmental functioning. The EIDP is based on a listing of developmental skills and provides a more comprehensive breakdown of skills by age level than is available through the BDI. With the severity of handicaps of children in this study, the EIDP may be more sensitive to child gains than the BDI and, thus, a more accurate indicator of child change.

Communication skills were a primary focus of the augmented condition, and the majority of children enrolled in the ARC exhibited language delays. The ICI assesses language development in seven areas (e.g., morphology, phonological) and, like the EIDP, will allow for a more sensitive assessment of child language skills than is provided by the BDI.

A videotaped sample of child developmental goals was obtained. The videotapes from the children enrolled in the research the first year have not been useful due to technical difficulties. Videotapes for the second year have been structured differently such that technical problems could be avoided. Videotapes have been recorded pre and post on a set of three developmental goal areas for each child. Goal areas were selected by the classroom teachers. These videotapes will be subject to a procedure similar to goal attainment scaling. Child progress on each goal will be scored by teachers experienced in early intervention but naive to the ARC study. This process should allow factors related to degree of handicapping condition to be taken into account; a factor not accounted for by developmental measures. This procedure should be extremely sensitive to changes in child functioning. The severity of handicaps of the ARC subjects may require such a sensitive procedure to elucidate group differences. Videotape observation procedures are being developed. After reliability has been established, scoring procedures will begin. Current timelines call for a December 1988 completion of this activity.

Another concern in regard to data collection is related to the specific effects the intervention had on teacher behavior and how differences in teacher behavior affect subject behavior. An ecobehavioral observation instrument was developed by LSU Human Development Center staff to address these and related questions in the ARC study and was employed in the second year of intervention. Ecobehavioral measurement is based on the theory that interaction between the child and environment is continuous, reciprocal, and interdependent (Bijou & Baer, 1978). The ecobehavioral approach assesses program variables through systematic observation and measures moment-to-moment effects of the interactions between environment, teacher behavior, and student behavior (cf., Carta & Greenwood, 1985). Data from the ecobehavioral observation will allow for the examination of the types of behaviors exhibited by teachers in the two conditions and the effect of these on child behavior. Observations for the ecobehavioral assessment were conducted on all subjects in April and May 1988. Data are currently being analyzed by LSU staff. Specifics on the instrument, observation procedures, interrater reliability, and results will be available before November 1988.

Recruitment, training, and monitoring of diagnosticians. Local test examiners were recruited from staff at the Louisiana State University (LSU) Human Development Center who were not involved with the ARC research. Examiners were kept blind to individual subject's group assignment. Examiners were certified as competent BDI administrators through procedures developed by EIRI. These procedures required a minimum of three practice administrations prior to a test session that was observed and rated by the LSU site liaison or EIRI assessment coordinator. In addition, examiners sent one videotaped BDI session to the EIRI assessment coordinator for review each year they served as examiners.

These training procedures occurred in addition to monitoring in the form of a 10% shadow score of all test administrations by the LSU site coordinator. All test protocols were then rechecked by EIRI clerks prior to entry on computer, and data on examiners was kept. No problems in test administration or scoring have been revealed by this process with the ARC examiners. Interrater reliability has consistently produced coefficients above .85.

Examiners also handed out parent completed surveys and measures during test sessions. These measures were described and assistance was given where needed. If unusual circumstances occurred (e.g., a parent unable to read), a second examiner was brought in to assist the parent. Parents were asked not to discuss their child's classroom placement.

The BDI examiners also administered posttest complementary measures. These measures were administered at the intervention sites but not in the classrooms. At the most recent posttest, an exception was made, and the Early Intervention Developmental Profile (EIDP) was administered in the classroom. Although examiners were not told which condition classrooms were in, differences may have been evident. The EIDP was the last measure administered. Shadow scoring of 10% of the complementary measures also occurred, and no problems were encountered. Examiners were trained in the administration of complementary measures prior to their use, although demonstrating competency was less rigorous than for the BDI.

Pretest. Subjects involved in the study during the first year were pretested in November and December 1986. Subjects newly enrolled in the study for the second year were pretested in October and November 1987. Testing occurred at each child's respective school. The BDI was administered, and parents, mostly mothers, completed the family measures. These included those measures described earlier and the Family Support Scale (FSS) and Family Inventory of Life Events (FILE). Families were paid a $20 incentive. Parents also provided demographic information.

First posttesting. Posttesting occurred at the end of the school year during the last 3 weeks of July and the first week of August during Year 1 and in May during Year 2. The posttest battery consisted of the core battery of tests and surveys as well as the complementary and treatment verification measures described earlier. Procedures described earlier were followed for posttest assessment. Parents were paid a $40 incentive at posttest.

Second posttesting. The second posttesting can be broken down into posttesting for children who remained at the ARC for a second year and for those children who "graduated" from the ARC. For those subjects who remained at the ARC for a second year, their second posttest followed the same procedures as during the first posttest. These subjects were administered the core battery, EIDP, and ICI. They were videotaped for the developmental progress scaling procedure and observed using the ecobehavioral instrument. Parents were again given a $40 incentive.

For subjects that "graduated" from the ARC, specific procedures for second posttesting have not yet been determined. This posttesting will include not only the child and parents, but the child's teacher as well. The core battery will be administered. Teachers will be asked to complete an information form and, possibly, the Vineland Adaptive Behavior Scales. Other measures may be selected as posttesting procedures become final. Parents and teachers will be paid an incentive. Second posttesting for these subjects is planned to occur before December 1988.

Results and Discussion

This study is examining the effect of two different procedures for training paraprofessionals on child and family functioning outcome measures. One training procedure, the basic (control) condition, is low intensive involving only minimal contact between professionals and paraprofessionals. The other procedure, the augmented (experimental) condition, is high intensive and makes use of a collaborative consulting model that involves frequent and sustained training contacts between the professional and paraprofessional. Data that has been analyzed for this report consists of the core data obtained on all subjects who have been involved in the research project for 1 year (information based on first posttesting only).

Data from complementary measures are being rescored for the EIDP and ICI and are not ready for analysis. Data from the videotape and ecobehavioral instrument are in early phases of analysis. Second posttesting data on subjects remaining in the ARC for a second year have been entered on computer but have not been examined for errors to the point where analyses can be conducted. Analyses on these other data sources will be forthcoming.

The following sections will examine group comparability on pretest measures and present the effects of intervention on child and family functioning.

Comparability of Groups on Pretest Measures

The comparability of groups on demographic characteristics was presented in Table 12.2 and discussed earlier. Differences were only observed in 2 of 18 variables. Group differences on pretest measures are presented in Table 12.4. Subjects in the basic and augmented groups were comparable in all BDI domains, on the BDI total score, and for chronological age at pretest. On measures of parent and family functioning, group differences were found only on PSI measures of child related and total stress. Parents of subjects in the augmented group appear to be more stressed than parents of basic condition subjects. No factors accounting for this greater amount of stress are readily evident in the data, as comparability of subjects exists in other areas. Families of subjects in both groups appear comparable in relation to sources of support, occurrence of major life events, and perception of the family in relation to the "ideal."

Table 12.4

Comparability of Groups on Pretest Measures
for ARC Paraprofessional Training Study

Variable	Basic			Augmented			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age in months at Pretest	23.7	(6.5)	32	23.0	(7.2)	32	.70
• Battelle Developmental Inventory (BDI)* DQs for:							
Personal Social	41.3	(28.0)	32	46.9	(22.6)	32	.56
Adaptive Behavior	50.6	(28.9)	32	49.7	(23.0)	32	.81
Motor	40.3	(27.4)	32	41.9	(21.4)	32	.74
Communication	50.4	(28.8)	32	44.1	(22.9)	32	.19
Cognitive	44.4	(29.5)	32	45.7	(24.6)	32	.74
TOTAL	45.8	(27.3)	32	47.9	(20.9)	32	.94
• Parenting Stress Index (PSI)**							
Child Related (range 50 to 250)	112.9	(21.5)	32	126.7	(15.0)	32	.004
Other Related (range 54 to 270)	129.1	(26.6)	32	134.1	(27.9)	32	.47
TOTAL (range 101 to 504)	242.0	(41.5)	32	260.6	(32.5)	32	.05
• Family Adaptation and Cohesion Evaluation Scales (FACES)†							
Adaptation (range 0 to 24)	8.9	(7.0)	32	8.2	(7.2)	32	.68
Cohesion (range 0 to 30)	8.5	(7.1)	32	8.2	(7.6)	32	.89
TOTAL (range 1 to 54)	17.4	(11.3)	32	16.4	(9.6)	32	.70
• Family Resource Scale (FRS) (range 30 to 150)	108.9	(15.8)	32	110.8	(20.7)	31	.67
• Family Index of Events (FILE)**(range 0 to 71)	10.1	(6.8)	32	10.4	(6.2)	31	.84
• Family Support ScaleΔΔ (FSS) Total Score (range 0 to 4)	1.9	(0.9)	31	..9	(0.8)	32	.70

NOTES: * Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the Table indicate the distance from "ideal" in raw score units. A score of 0 is best.

Δ Analyses for the FRS is based on raw scores indicating number of resources reported as being available. Higher scores are considered better.

ΔΔ Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support reported. Higher scores are considered better.

** The PSI and FILE are based on raw scores where lower scores are considered better.

Measures of Child Functioning

Table 12.5 presents the effects of alternate forms of intervention on measures of child functioning from the BDI. Effects for the measures of child functioning were obtained using an analysis of covariance procedure completed on SPSS-PC. Covariates for these analyses were selected based on a two-step procedure.

Table 12.5

Posttest Measures of Child Functioning for Alternative Intervention Groups for ARC Paraprofessional Training Study

		Basic				Augmented						
Variable	Covariates &	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES$^{\Delta}$	P Value
Average length of intervention in months	–	6.8	(1.3)		32	7.0	(1.4)		32	.66	.15	.42
Age in months at posttest	–	30.6	(6.6)		32	30.3	(7.3)		32	.03	-.05	.87
Battelle Developmental Inventory (BDI)*												
Personal-Social	1,7,8,9,10	54	(30)	56	30	51.0	(29)	49	32	3.66	-.23	.06
Adaptive Behavior	2,7,8,9,10	59	(31)	57	30	53	(23)	54	32	.45	-.10	.51
Motor	3,7,8,9,10	48	(33)	48	30	44	(24)	43	32	.68	-.15	.41
Communication	4,7,8,9,10	50	(28)	47	30	44	(24)	47	32	.00	.00	.98
Cognitive	5,7,8,9,10	48	(29)	48	30	39	(24)	39	32	4.47	-.31	.04
Total	6,7,8,9,10	53	(29)	53	30	49	(23)	49	32	2.25	-.14	.14

NOTES: * Statistical Analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

Δ Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

& Covariates: 1 = BDI personal-social; 2 = BDI adaptive; 3 = BDI motor; 4 = BDI communications; 5 = BDI cognitive; 6 = BDI total; 7 = PSI total; 8 = PSI child; 9 = HRPA (Household Receiving Public Assistance); 10 = Both parents living at home.

Correlations between all pretest measures and child outcome measures were obtained. Measures where significant correlations were obtained were entered into a multiple regression formula using the outcome measure as the independent variable. Measures found significant in this analyses were included as covariates. In addition, those variables on which groups were found to be significantly different at pretest were included as covariates. Effects for measures other than child functioning included on Table 12.3 were analyzed using an analysis of variance procedure. The results of the analyses reported in Table 12.3 demonstrate no significant effects of intervention as assessed by the BDI. Group differences favoring the basic group occurred on the BDI personal-social and cognitive domains.

Measures of Family Functioning

Table 12.6 presents the effects of alternative forms of intervention on measures of family function. Descriptions of procedures used to determine effects and covariates discussed for Table 12.5 apply to this table and will not be repeated. These results suggest that the alternate forms of intervention do not have a significant effect on parent stress, family resources, or perception of family toward an "ideal." Parent and family perceptions on these measures do not change as a result of having a child in either the basic or augmented condition.

Conclusions

The results of this study indicate that children in the augmented condition do not signficantly improve over children in the basic condition. Also, benefits to families do not appear to occur as a function of specific group placement. This result in regard to family functioning is not surprising, as this intervention has little impact on families other than providing a source of day care, and this benefit occurs equally to the basic and augmented group parents.

Table 12.6
Posttest Measures of Family Functioning for Alternative Intervention Groups for ARC Paraprofessional Training Study

Variable**	Covariate#	Basic $\overline{X}$	Basic (SD)	Basic Adj$\overline{X}$	Basic %	Basic n	Augmented $\overline{X}$	Augmented (SD)	Augmented Adj$\overline{X}$	Augmented %	Augmented n	ANCOVA F	ES$^{\Delta}$	P Value
Parent Stress Index (PSI)*														
Child Related	1,3,8,9	111.7	(21.0)	115.4	82	32	121.5	(17.5)	117.7	87	32	.28	-.11	.60
Other Related	1,2,3,8,9	115.5	(24.1)	118.6	43	32	124.7	(26.8)	121.6	52	32	.27	-.12	.60
Total	1,3,8,9	227	(42.2)	234.0	66	32	246.2	(38.3)	239.3	70	32	.35	-.13	.56
Family Resource Scale (FRS)*														
Total	1,2,3,8,9,10, 11	109.5	(22.6)	110.9	37	31	114.2	(26.1)	112.8	40	31	.09	.08	.76
Family Adaptation & Cohesion Evaluation (FACES)†														
Cohesion	1,3,6,8,9,12	8.3	(6.9)	7.8		31	7.5	(7.9)	7.5		31	.00	.04	.95
Adaptation	1,3,8,9,11	8.7	(6.9)	8.6		31	8.8	(6.9)	8.9		31	.04	.04	.85
Total	1,2,3,5,8,9	17.0	(8.0)	16.7		31	16.3	(7.9)	16.6		31	.01	.01	.94

$^{\Delta}$Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FACES, the numerator for the ES is calculated as: Basic-Adjusted, as lower scores are preferred.

* Statistical analyses and Effect Sizes (ES) for the PSI and FRS were based on raw scores where low raw scores are most desirable.

† Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal" where a score of 0 is considered best.

** To assist with interpretation of the PSI and FRS, an approximate percentile score is reported in the table based on the covariance adjusted score and data collected as part of the EIRI Longitudinal Studies.

# Covariates: 1 = PSI child; 2 = PSI other; 3 = PSI total; 4 = FRS; 5 = FACE total; 6 = FACE cohesion; 7 = FACE adaptation; 8 = HRPA (Household Receiving Public Assistance); 9 = Both parents living at home; 10 = FRS general resources; 11 = FACE perceived raw scores; 12 = Child age at pretest.

The results from the child measures, on the other hand, are surprising and disheartening. Observations of these two conditions, as reflected in the site review, clearly indicate a significant difference in the way classrooms in these conditions are organized and in the implementation of intervention services. All site reviewers (and, it can be assumed, most early intervention practitioners would agree) strongly favored the augmented condition. That this condition is not more effective and that aspects of the less intensive training model may produce greater child benefits could possibly result in a re-evaluation of the way services to infants are delivered.

Before these re-evaluations are made, there are areas that need to be examined within the current data set. The severity of the handicapping conditions of subjects in this study requires investigation. Analyses with the complementary measures and analyses by subgroups based on severity may reveal new findings.

Another area for examination is the data from the ecobehavioral instrument. These data will allow analyses of specific teacher and child behavior and the examination of how these effect outcome measures. These and other analyses will be conducted.

Regardless of the final results, this study will provide data in an area, involvement of paraprofessionals, where little exist. Practices in the field will hopefully be affected in a way that benefits all involved in providing services to young children who are handicapped.

Future Plans

The intervention phase of this study is now complete. Future research activities will focus on following children as they progress through the school district and on obtaining appropriate posttest data. The demographic nature of this subject pool and the size of the subjects' school districts may combine to make follow-up a difficult task. Input from professionals and parents in the New Orleans area will be sought to facilitate this process. Analyses related to follow-up will also be continuing. The results of these analyses will provide useful information regarding this research study.

DES MOINES PUBLIC SCHOOLS

Project #13

COMPARISON: Mildly to Severely Handicapped Children -- Center-based intervention plus parent training vs. center-based intervention only

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EIRI COORDINATOR: Mark Innocenti

LOCATION: Des Moines, Iowa

DATE OF REPORT: 10-8-1988

Rationale for the Study

Parent involvement is often considered an important part of early intervention programs for young children who are handicapped. This belief is so strong that it has been incorporated into the law mandating services for these young children, P.L. 99-457. Unfortunately, this belief is not backed by strong empirical findings. Concerns have been raised regarding the efficacy of parent involvement in general and, specifically, to what types of parent involvement are most beneficial to children and families (Casto & Mastropieri, 1986). This study is examining the effect of parent involvement, in the form of weekly parent training meetings focused either on training parents to work with their children on skills/behaviors or on parent support issues, when included as part of a center-based intervention program.

Review of Related Research

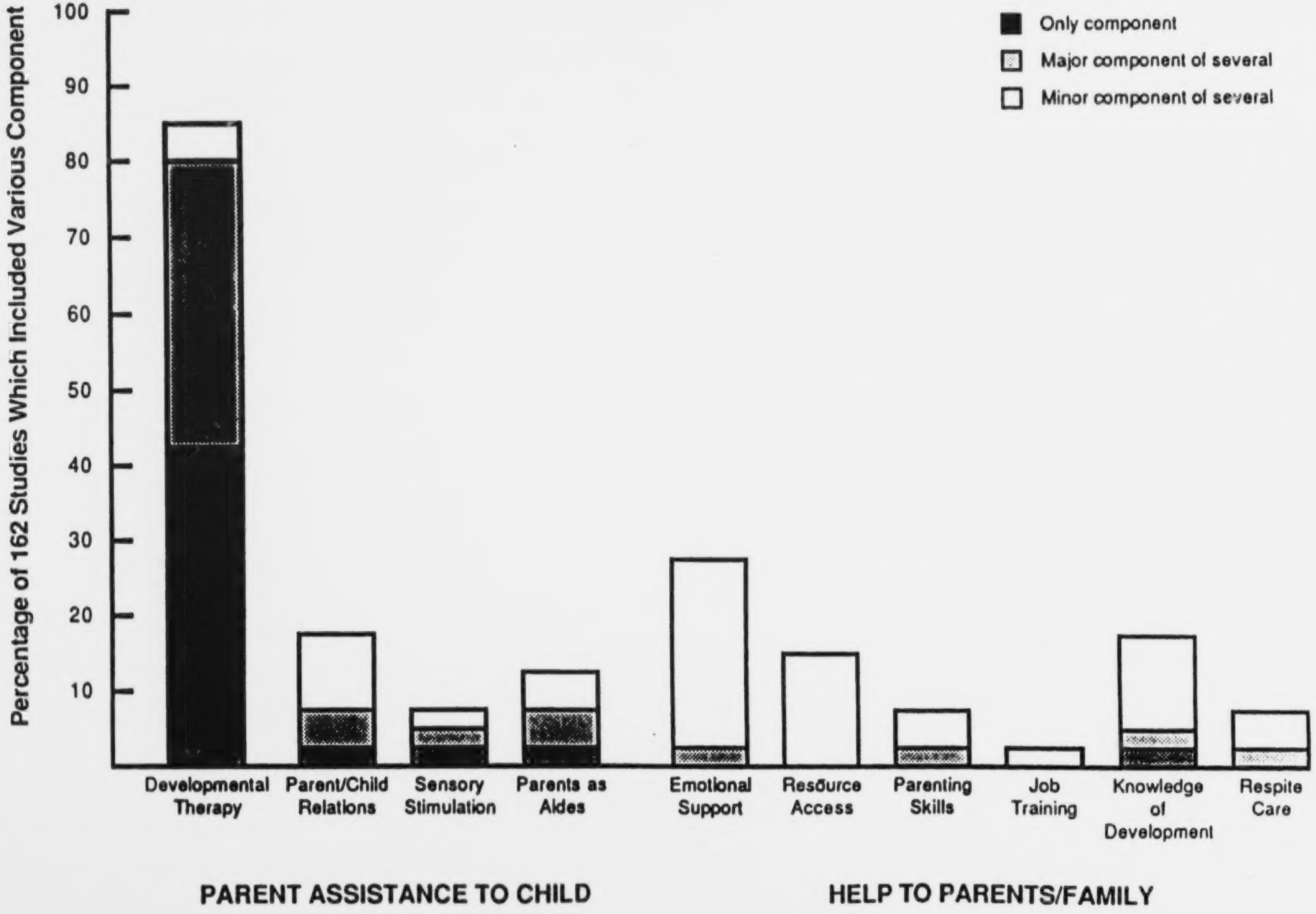
Over the years, findings from studies focusing on training parents of children who are handicapped have generally reported positive results (e.g., Baker, 1976). However, many of these studies suffer from procedural limitations and methodological problems. These limitations include: (a) the failure to assess mastery of principals and procedures taught (Heifetz, 1977; Watson & Bassinger, 1974); (b) reliance on only parent verbal report (Baker, Heifetz, & Murphy, 1980); and (c) a focus limited to short-term changes (Baker, 1976, 1980; Lutzher, McGimsey, McRae, & Campbell, 1983).

In addition, most of this research neglects a possible significant aspect of this training. The importance of demonstrating the feasibility and effectiveness of parent training treatments within the ecological context of the family is being increasingly emphasized by a number of researchers (e.g., Blacker, 1984; Kaiser & Fox, 1986). These researchers suggest that parent training may have positive effects for the parent and family. Families of handicapped children are likely to be highly stressed (Gallagher, Beckman, & Cross, 1983) and in possible need of assistance to continue functioning as a "normal" family unit. Unfortunately, research on the efficacy of parent training interventions have not included the assessment of possible impacts on family functioning.

A difficulty in doing research on the efficacy of parent training programs in early intervention is the definition of what constitutes parent training. Gatling and White (1987) defined two general types of parent training: (a) those that use parents in some way to enhance the handicapped child's developmental progress (training); and (b) those that provide assistance to parents or other family members to enhance family functioning, coping ability, satisfaction, or ability to manage the stress of having a handicapped child as a family member (support). Based on their analysis of 162 previously completed early intervention studies that included a substantial family involvement component, Gatling and White (1987) further subdivided these two general areas, as shown in Figure 13.1, and determined the frequency with which each type of parent involvement had been included in previously reported research.

The results of that analysis are both enlightening and provocative. First, as shown in Figure 13.1, it is clear that most parent involvement programs have primarily focused on using parents as developmental therapists with their child. Second, programs to provide assistance and support to nonhandicapped family members have been

Figure 13.1


Percentage of 162 Studies Which Included Various Component
100
90
80
70
60
50
40
30
20
10
■ Only component
▨ Major component of several
☐ Minor component of several
Developmental Therapy
Parent/Child Relations
Sensory Stimulation
Parents as Aides
Emotional Support
Resource Access
Parenting Skills
Job Training
Knowledge of Development
Respite Care
PARENT ASSISTANCE TO CHILD
HELP TO PARENTS/FAMILY

used very infrequently. Based on this analysis, the parent involvement component for this intervention study (Parents Involved in Education, PIE; Pezzino & Lauritzen, 1986) was structured to include those components that had been used most frequently in past research (i.e., parents as a developmental therapist for their child). Parent support issues were also included in the PIE, but the primary focus was on teaching parents to provide supplemental therapy to their handicapped children.

Overview of Study

Parent training interventions, similar to the PIE, are commonly offered as an addition to an established early intervention program (Gatling & White, 1987). In order to resolve some of the concerns regarding parent training as an intervention, it was preferable to simulate current common practices. The present study approached the question of parent training by comparing a formal parent training intervention (the PIE) added onto a center-based intervention program versus the effects of the center-based program without the parent training component. This study assessed the impact of these interventions on both child progress and family functioning across the time the intervention was in effect, and longitudinal impact will be assessed. Methodological limitations present in earlier research are being addressed through the direct assessment of children and their families, through assessment of parent mastery of information, and through the examination of long-term effects.

In addition, this study investigated the issue of whether parent intervention should be training or support-oriented (cf. Gatling & White, 1987). Parent support as an appropriate focus for parent intervention is receiving attention and interest in recent literature (e.g., Dunst, 1985; Hanline & Knowlton, 1988; Zeitlin & Williamson, 1988). Little information regarding the optimal way to provide parent support services exists for preschool-aged children, and no comparative information exists on the effect of a parent support intervention on children and families. To provide some preliminary answers to such questions, parents who participated in PIE and whose children remained in the early intervention program for a second year participated in an intervention focused on parent support issues (PIE II; Durbala & Hollinger, 1988). The format of PIE II was similar to that of PIE I, except the focus of the intervention was altered. Results from parents and children involved in PIE II will allow comparisons to be made between those receiving intervention only with PIE and those receiving center-based intervention only, as well as intra-subject comparisons of those receiving both PIE and PIE II.

Methods

Subjects participating in this study were served through the Des Moines Public School System. The Des Moines public schools serve all children who are handicapped in the Des Moines School District from birth through 6 years of age. (The State of Iowa has had a law mandating a free and appropriate public education to children birth through 5 since 1975.) Handicapped children in the Des Moines Public Schools ages 0-2 are typically served through home-based intervention programs, while handicapped preschoolers ages 3-6 typically receive intervention services in center-based settings. The general philosophy of the Des Moines Public Schools is to provide high-quality educational services that maximize each child's individual potential. Programs are developed based on comprehensive individual assessments conducted by members of a multidisciplinary team. Parents are required to participate in the development of Individualized Education Plans and are strongly encouraged to become involved with the educational process.

Subjects participating in this study were served at the Phillips, Findley, and Perkins schools. This represents three of many schools in the Des Moines Public School System in which handicapped preschoolers are served. These specific schools were selected because teachers and professional support staff (psychologists, speech therapists, occupational therapists, social workers) who work in these schools volunteered to conduct this research study in collaboration with EIRI. The liaison person at the Des Moines site who is responsible for coordinating the day-to-day activities of the research study is a school psychologist employed by the school district who has responsibilities at each of the three participating locations.

Subjects. The subjects that have been enrolled in this project can be broken down into three distinct cohorts. The first cohort is those subjects who were enrolled during the 1986/87 academic year. There were 56 subjects in this cohort (30 control, 26 experimental), 40 of whom are male. The subjects ranged in age from 35 to 72 months at the time they became involved in the research.

The second cohort consists of those subjects newly enrolled during the 1987/88 academic year. There were 20 subjects in this cohort (12 control, 8 experimental), 15 of whom are male. The age of subjects in this cohort ranged from 36 to 72 months when intervention began.

The third cohort consists of those subjects who participated in the research for 2 years. This cohort consisted of 34 subjects (15 control, 19 experimental), 22 of whom were male. These subjects ranged in age from 35 to 61 months when their participation began. These subjects are included in the first cohort, but analyses for these subjects as a separate cohort will also occur.

For this report, the analyses will examine subjects who received 1 year of intervention. This includes all subjects from the 1986/87 and subjects newly enrolled from the 1987/88 academic years. This group was comprised of 76 subjects (42 control, 34 experimental), 55 of whom were male. These subjects ranged in age from 35 to 72 months at the time they began participation in the research.

Subjects included in this group represent a variety of handicapping conditions, because of the Iowa law mandating that all children with developmental delays and handicapping conditions be served. Approximately 75% of subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive and language impairments. The degree of handicap for all subjects ranged from severe/profound to mild. The majority of subjects were mild to moderately delayed.

Recruitment. Parents of children in participating schools who were scheduled for preschool placement at the beginning of the academic year were considered for inclusion in the study if the following criteria were met: (a) One parent was not working or the parent could guarantee time off from work. This was done to help ensure parents had time available to attend parent meetings. (b) The child was not profoundly retarded. Preschool program staff were of the opinion that the needs of parents of these children would not be best met through a parent training program. Parents of children at the participating schools who met these criteria were individually approached by preschool program staff. Preschool staff described the research and detailed parent and staff requirements. Placement in study group by random assignment procedures was described. If interested, parents returned an informed consent letter that clarified their requirements for participation, research staff obligations, and stated that assignment to groups would be randomly determined. Approximately 95% of the parents who were approached regarding the research agreed to participate.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups prior to the initiation of treatment, either to a group in which parents received additional training (parent training) or to a group in which parents received no additional training (no parent training). Both groups continued to receive the same level of center-based services that were previously available through the school's program for handicapped preschoolers.

In order to ensure the comparability of groups, subjects were randomly assigned to groups after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (17-42 months, 43-54 months, and over 55 months) and level of parent motivation (either "high" or "low") as perceived by each child's teacher. Categorizing subjects in this way resulted in subjects falling into one of six mutually exclusive categories. Within each of the six categories, subjects were rank ordered from low to high based on their CAPER scores (the CAPER, a test of developmental functioning, was administered by school personnel at an earlier date).

After subjects were categorized, they were then alternately assigned to one of the two conditions. Group determination of the first-listed subject (the subject with the lowest DQ score) in each age by motivation category was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups. Subjects that participated for 2 years remained in the originally assigned group.

Attrition. Of subjects enrolled in the research for one full academic year, 18 subjects have dropped from the study. Five of these were control subjects, 13 experimental subjects. For control subjects, attrition was related to a move from the area; in three cases, this move occurred prior to any intervention occurring. The majority of experimental group attrition was related to parent inability to attend parent training meetings. For all but one subject, attrition occurred after intervention began. Attrition for the parent training group was defined as the parent indicating that he/she was not interested in continued participation in the research project. This differs from the case where the parent attended parent training group meetings infrequently, but did not express a desire to be removed from the study. No attrition has occurred with those subjects enrolled in the research for two consecutive years. Information on subject attrition from those subjects enrolled during the 1986/87 academic year who graduated to school-age programs will be available in October 1988.

Demographic characteristics. The subject pool for this study is complete, and no new subject recruitment will occur. Future efforts will focus on the collection of follow-up data. Subjects for this study represent a fairly homogenous sample (see Table 13.1). The majority of subjects are caucasian males with one sibling. The

Table 13.1

Comparability of Groups on Demographic Characteristics for Des Moines Parent Training Study

All Subjects Included in Analysis

Variable	No Parent Training			Parent Training			P Value
	X̄	(SD)	n	X̄	(SD)	n	
• Age of child in months at pretest	52.98	(11.7)	42	52.35	(11.9)	34	.82
• Age of mother in years at pretest	28.16	(5.6)	40	30.81	(4.8)	33	.03
• Age of father in years at pretest	30.34	(6.8)	33	33.05	(6.1)	27	.12
• Percent Male *	71.4		42	73.5		34	.84
• Years of Education for Mother	11.38	(2.3)	39	12.65	(1.9)	34	.01
• Years of Education for Father	11.84	(2.2)	31	13.0	(2.6)	28	.07
• Percent with both parents living at home	73.7		38	77.4		32	.30
• Percent of children who are caucasian *	80.5		41	91.2		34	.20
• Hours per week mother employed	6.68	(12.4)	38	5.44	(11.3)	32	.66
• Hours per week father employed	32.11	(22.6)	27	34.5	(21.7)	28	.69
• Percent of mothers employed as technical managerial or above *	5.4		37	3.0		33	.63
• Percent of fathers employed as technical managerial or above *	7.4		27	39.3		28	.005
• Total household income	$14,434	(15,683)	38	$21,632	(18,323)	34	.08
• Percent receiving public assistance	65.9		41	35.3		34	.008
• Percent with mother as primary caregiver *	96.0		40	97.1		34	.66
• Percent of children in day care more than 5 hours per week *	5.1		39	2.9		34	.64
• Number of siblings	1.31	(0.8)	41	1.47	(0.8)	34	.42
• Percent with English as primary language	100		41	100		34	---

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored at "0."

parents of the subjects are in their late 20s or early 30s and have a high school education. The majority of subjects' families are intact, in that both parents live at home, and traditional in the sense that the mother is the primary caregiver. English is the primary language for all families. Family income place the families as lower to middle class.

Table 13.1 presents data comparing all subjects included for analysis in this report by group on demographic characteristics and indicates some discrepancies between the no parent training (control) and parent training (experimental) group. Mothers of subjects in the parent training group tend to be older than mothers of subjects in the no parent training group, and they also have higher levels of education. Fathers of subjects in the parent training group have more education than their no parent training counterparts. Fathers of parent training subjects are much more likely to hold occupations placing them in higher SES categories. In addition, household income for families of subjects in the parent training group tends to be higher than that for no parent training subjects' families, and significantly more control subjects' families in the no parent training group receive public assistance. These discrepancies in demographic characteristics are favorable toward the parent training group. Thus, this appears to provide an initial bias in favor of finding positive intervention effects. Variables where discrepancies occur will be considered as covariates in later analyses, as appropriate.

On measures that present demographic information on fathers, data are presented from a smaller "n" then many other variables. This can be partly attributed to data collection methods. Mothers were the primary providers of demographic and family functioning measures. In the majority of cases where "father data" was not obtained, it was not obtained from families where the father was not living at home with the child. For example, 67% of cases where the father was not living with the child were unable to provide information on father occupation, versus 7% of families where fathers were living with the child.

To examine the effect of subject attrition on the pool of subjects, attrition analyses were conducted. Initial analyses compared all subjects who dropped from the study with those that remained on demographic and pretest measures. No significant differences were found on any of the measures. Where the majority of attrition occurred in the parent training group, the attrition analysis was again conducted for this group alone. The data from this analyses on demographic and pretest measures are presented in Tables 13.2 and 13.3.

A significant difference was found on two measures; the report of families who receive public assistance and pretest scores from the Family Support Scale (FSS). Although differences were found on the public assistance measure, other factors that may result in the need for public assistance (e.g., income, hours per week father and mother employed, SES status of father and mother) were not found to be different between groups.

The data presented in Table 13.3 on the FSS is a ratio derived by dividing a perceived support score obtained from various possible support areas by the number of reported sources of support. Higher scores indicate more support. Parents who dropped from the parent training group have fewer sources of support as measured by the FSS. Research across EIRI studies can be conducted to further examine this finding. Overall, the data presented in Tables 13.2 and 13.3 indicate that attrition was not related to a specific subgroup of the sample, except, perhaps, in the area of family support.

Intervention Programs

The Des Moines Public School System provides educational services to preschool-aged children, ages 3 through 6, who exhibit developmental delays or who are handicapped. These children receive center-based, half-day, 5-day-per-week

Table 13.2

Attrition Analysis on Demographic Characteristics of Subject Who Remained or Dropped from the Parent Training Group for Des Moines Parent Training Study

All Parent Training Group Subject

Variable	Remained			Dropped			P Value
	X̄	(SD)	n	X̄	(SD)	n	
• Age of child in months at pretest	52.3	(11.9)	34	48.5	(11.9)	11	.36
• Age of mother in years at pretest	30.8	(4.7)	33	28.4	(4.8)	10	.17
• Age of father in years at pretest	33.1	(6.1)	27	33.9	(6.3)	[illegible]	.75
• Percent Male *	73.5		34	75.0		13	.92
• Years of Education for Mother	12.6	(1.9)	34	12.0	(1.6)	12	.31
• Years of Education for Father	13.0	(2.6)	28	12.2	(3.3)	9	.47
• Percent with both parents living at home	77.4		31	58.3		12	.22
• Percent of children who are caucasian *	91.2		34	69.2		13	.14
• Hours per week mother employed	5.4	(11.3)	32	7.3	(13.8)	12	.64
• Hours per week father employed	34.5	(21.7)	28	30.0	(24.5)	6	.66
• Percent of mothers employed as technical managerial or above *	3.0		33	0.0		13	---
• Percent of fathers employed as technical managerial or above *	39.3		28	28.6		7	.61
• Total household income	$21,632	(18,323)	34	$23,916	(26,811)	6	.79
• Percent receiving public assistance	35.3		34	69.2		13	.04
• Percent with mother as primary caregiver *	97.1		34	100.0		12	---
• Percent of children in day care more than 5 hours per week *	2.9		34	0.0		12	---
• Number of siblings	1.5	(0.8)	34	1.5	(1.5)	13	.88
• Percent with English as primary language	100.0		34	100.0		13	---

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Table 13.3
Attrition Analysis on Pretest Measures of Subjects Who
Remained or Dropped from the Parent Training Group
for Des Moines Parent Training Study

All Parent Training Group Subjects

Variable	Remained			Dropped			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Battelle Developmental Inventory (BDI)* DQs for:							
Personal Social	67.0	(19.0)	34	63.0	(12.0)	11	.31
Adaptive Behavior	63.0	(22.0)	34	70.0	(14.0)	11	.61
Motor	63.0	(22.0)	34	71.0	(17.0)	11	.72
Communication	57.0	(21.0)	34	59.0	(20.0)	11	.81
Cognitive	64.0	(20.0)	34	67.0	(20.0)	11	.73
TOTAL	63.0	(17.0)	34	65.0	(12.0)	11	.84
• Parenting Stress Index (PSI) Δ							
Child Related (range 30 to 250)	117.4	(18.4)	34	121.0	(24.5)	13	.72
Other Related (range 54 to 270)	131.6	(28.8)	34	122.8	(22.8)	13	.58
TOTAL (range 101 to 505)	248.9	(43.3)	34	243.8	(44.2)	13	.33
• Family Adaptation and Cohesion Evaluation Scales (FACES)†							
Adaptation (range 0 to 24)	5.7	(4.4)	34	6.2	(5.8)	13	.74
Cohesion (range 0 to 30)	6.6	(5.4)	34	5.2	(2.6)	13	.40
TOTAL (range 1 to 54)	12.3	(7.3)	34	11.5	(6.1)	13	.73
• Family Resource Scale (FRS)** (range 30 to 150)	116.3	(19.5)	34	118.4	(17.8)	13	.73
• Family Index of Events (FILE)** (range 0 to 71)	11.9	(8.0)	34	9.6	(6.9)	13	.36
• Family Support Scale (FSS) Total Score ΔΔ (range 0 to 4)	2.2	(0.8)	33	1.7	(0.4)	13	.03

NOTES: * Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (See Appendix A for details).

** Analyses for the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

Δ Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

ΔΔ Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

intervention services. Children receive services in educational formats (i.e., large group, small group, and one-to-one) according to their individual needs from special education teachers and teacher associates (paraprofessionals). Language and motor therapists assess children, provide teachers with objectives, help teachers integrate instructional therapeutic activities into on-going routines, and provide individualized services as needed. Teachers are free to use various curricula or develop their own objectives when developing intervention goals and strategies.

The Des Moines Public School Early Intervention Program provides services to a wide variety of children who are handicapped, from those exhibiting mild delays to those exhibiting more severe handicaps. The majority of children served are caucasian, and a wide variety of SES levels are represented. As part of these services to children, parents are regularly involved in IEP meetings, and teachers will attempt to include and keep parents informed of classroom activities as child and parent needs dictate. Classroom teachers are free to determine levels of parent involvement for their classrooms. In practice, this results in regular parent contact regarding child progress and participation at IEP meetings.

The purpose of the research study occurring with the Des Moines Public School Early Intervention Program was to compare the effects of their current service delivery system with the same system enhanced by the inclusion of systematic parent training efforts. In both the control and experimental conditions, children received services in the center-based Des Moines Public School Early Intervention Preschool Program. No changes were made to this system for the purposes of the study. In the experimental group, parents of children enrolled in the early intervention program were exposed to a systematic parent training curriculum. In their first year of involvement, parents received training based on the Parents Involved in Education (PIE) training package (Pezzino & Lauritzen, 1986). Parents whose children remained in the program for a second year and were in the experimental group received training in the Parents

Involved in Education II (PIE II) training package (Durbala & Hollinger, 1988). Data on group assignment and numbers in the possible cohorts are presented by academic year in Table 13.4.

Table 13.4

Group Assignment Information by Academic Year

	Academic Year	
n	1986/87	1987/88
7	PIE I (Parent as therapist)	"Graduated" into public school
19	PIE I (Parent as therapist)	PIE II (Family support)
8		PIE I (Parent as therapist)
15	No parent training	"Graduated" to public school
15	No parent training	No parent training
12		No parent training

Basic intervention program, no parent training. Children assigned to this group attended an existing center-based, half-day, 5-day-per-week intervention program in which they received small group and individualized teaching sessions from special education teachers and paraprofessional aides. All teachers were certified and were responsible for supervision of their respective aides. None of the aides were certified as teachers. Their training consisted mostly of periodic inservices provided by the school district that both teacher, aides, and support staff attend, and on-the-job training provided by their respective teachers and the collaborating speech and motor therapists. Each class of approximately 10 children had one special education teacher and one aide. Because each child's program was "IEP driven," motor and speech therapists' contact with children varied widely. In general, a motor and speech therapist was present in each class for the equivalent of 1-day-per-week. During a typical day, children were instructed in the motor, speech and language, self-help, cognitive, and social skills areas. As part of the regular services to children, parents were involved in IEP meetings, and teachers were free to structure other aspects of parent involvement as the IEP dictated. Activities generally consisted of progress notes and meetings with parents, along with suggestions for home activities.

The CAPER, along with other curriculum-linked assessment tools were used in determining intervention goals and strategies. Intervention activities were developed from comprehensive assessments and items drawn from a number of curricula. Teachers were free to select curriculum based on child need. The skill sequences in the curricula used extended beyond the child's current level of functioning, and functional skill training routines were included in the curricula to the degree appropriate. Language and motor therapists provided individualized motor and speech and language instruction to the children, and assisted teachers and aides with the implementation of related activities in the classroom.

Parent training intervention. In addition to the center-based service described above, parents of children in this group received an intensive, systematic parent training intervention. Children in the basic and parent training interventions were not segregated by classroom or teacher in the center-based service. The parent training intervention was based on the Parents Involved in Education (PIE) training package (Pezzino & Lauritzen, 1986). PIE training modules were taught by the preschool professional staff and were designed to provide parents with a systematic, conceptual, and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small-group lecture, discussion, and demonstrations. The average small group size was between 8 and 12 parents. Training sessions consisted of 16, 2-hour sessions presented roughly one per week. Training sessions also included a social support component in which parents had the opportunity to share feelings and express problems, challenges, and other issues associated with their lives. Parents were primarily responsible for determining the agenda for the social support component of the session. This occupied the last 15 minutes of the session and focused on issues such as problems with relatives, finding day care, etc. In addition to these sessions, parents were asked to practice the parent intervention training at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral, i.e., compliance, skill), implement a short training session, and measure progress by comparing successful completion of the task before and after the intervention.

Parents whose children remained in the preschool program for a second year continued to receive training through a systematic, parent training intervention, but through a different intervention package. The children continued in appropriate center-based services. Parents received training based on the Parents Involved in Education II (PIE II) training package (Durbala & Hollinger, 1988). The PIE II was developed based on a parent needs assessment and focused on parent support issues. Issues such as dealing with parent stress, developing parent communication skills, teaching problem-solving communication skills, and providing information on areas of interest were addressed. The training format for PIE II was the same as PIE, except 12 sessions were held. Parent home activities that were presented focused on support (e.g., practice parent-focused stress reduction technique, find out relevant information) rather than child training issues. As in PIE, a social support component was available at the end of each session.

PIE and PIE II were conducted by preschool program support staff (e.g., school psychologists, speech and language therapists, etc.). Classroom teachers and aides were not involved in the parent training and were only indirectly aware of the goals of parent training. Each PIE group was conducted by a team of two staff members. All parent trainers received instruction in PIE and PIE II by their respective developers prior to its initial implementation. Parent training meetings were primarily attended by the children's mothers. Table 13.5 lists the session topics for PIE I and PIE II.

Table 13.5
Content of PIE I and PIE II

Session	Topic
PIE I	
1.	Introduction and overview
2.	Objective observation of child behavior
3.	Defining and measuring behavior
4.	Principles of behavior management
5.	Analyzing behavior chains
6.	Theories of child development
7.	Testing and assessment
8.	Criterion-referenced assessment
9.	Developing learning objectives
10.	P.L. 99-142 and IEPs
11.	Intervention strategies
12.	Factors related to teaching success
13.	Practice teaching session
14.	Determining appropriate interventions
15.	Communicating with professionals
16.	Review, comments, concerns, questions
PIE II	
1.	Parent needs assessment and introduction
2.	Child development and behavior management
3.	Stress reduction
4.	Communication
5.	The grief process
6.	Understanding feelings and attitudes of siblings and extended family members
7.	Promoting family fun
8.	Creating a home environment conducive to learning
9.	Roles and responsibilities of school personnel: Dialogues
10.	Community services
11.	Children's rights and advocacy
12.	Review, questions, and evaluation

Treatment verification. A number of procedures have been implemented in order to provide an independent verification of the specifics of the intervention program. Some treatment verification data are presented in Table 13.6 (missing parent satisfaction and intervenor rating data are in the process of being obtained). Child attendance data for basic services and parent attendance data for parents' training sessions were recorded throughout the year. Child attendance was recorded daily, and parent attendance data (for the parent training group) was recorded weekly; these data were sent to EIRI on a monthly basis. An initial analysis of attendance data indicates no

Table 13.6

Treatment Verification Data for Des Moines Parent Training Study

Variable	No Parent Training			Parent Training			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• General health of child[&]	2.0	(0.5)	39	1.9	(0.7)	32	.66
• Percent child attendance	87.3	(7.9)	38	90.0	(6.6)	34	.13
• Parent satisfaction[Δ]	24.9	(2.5)	29	25.1	(2.9)	26	.73
• Teacher rating of parents[#]	5.6	(2.0)	30	7.0	(1.9)	28	.008
• Hours of speech therapy[*]	3.0	(13.1)	42	8.7	(37.1)	28	.40
• Hours of PT/OT therapy[*]	1.1	(4.5)	42	6.8	(3.6)	33	.74
• Hours in day care[*]	72.0	(222.4)	42	108.8	(251.4)	33	.50
• Hours in Head Start or[*] preschool	59.2	(131.9)	42	75.9	(131.7)	33	.58

[&] Based on a parent rating of the child's health where: 1 = worse than peers; 2 = same as peers; 3 = better than peers.

[Δ] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[*] Data are based on parent report, obtained at posttest, of child time in the service during the past year.

difference in child attendance rates as a function of group placement (Table 13.6). Average attendance for all subjects was 88.2% of possible school days.

Average attendance by parents at the training sessions was 47.6% of all PIE classes for all parents. Fifty-seven percent of parents attended between 5 and 11 classes; only 13% of parents (5 parents) attended more than 75% of the time. These absences occurred in spite of repeated attempts by program staff to encourage regular attendance. These data pertain only to PIE I (for analysis in this report) and will need to be considered when conducting data analysis and discussing results.

A description of quality of parent involvement was also gathered annually by a direct intervenor (teacher) who worked most closely with the respective parent. The data obtained was the intervenor's perception (low, average, high) of how a parent rated on attendance, knowledge, and support. These data are presented in Table 13.6. Teachers rated parents in the parent training group as having a higher quality involvement with the school program. This occurred although teachers were not directly informed of child group placement (although information could have been shared by parent and teacher or indicated through other cues).

In addition to the intervenor's rating of parents, parents were asked to rate their satisfaction with the program (see Table 13.6). Parents rated the intervention program on seven questions that assess satisfaction in a variety of areas (e.g., staff, participation, communication, etc.). Parents in both groups were equally satisfied with the center-based program.

Health data on each child was also obtained as an additional verification measure. Data on hospitalizations (and length), days with fever, a general health rating of the child, and other factors were collected. Data on child general health are presented in Table 13.6, and no differences between the study groups are indicated.

Teachers in the Des Moines district were also evaluated annually by their immediate supervisor. These data are relevant to treatment verification. Teachers were rated by their supervisor either as being satisfactory or as needing training. The Des Moines School District uses only two rating levels as per an agreement with the local teachers' union, and no other evaluations can be conducted as per the contract. All teachers of subjects involved in this study received a satisfactory rating.

Data on activities parents engage in with children and data on other therapies, services, etc. received by the subject are collected as treatment verification data. During the 1986/87 academic year, parents in the parent training group were asked to submit weekly postcards that indicated the amount of time they spent doing instructional activities with their child. Parents in the no parent training group were asked to submit postcards for three separate weeks during the year. In order to encourage parents to consistently turn in postcards, EIRI provided a free developmental toy as an incentive for families that turned in 10 consecutive postcards. If parents were late in submitting their weekly postcards, a reminder phone call was made. If they still did not turn them in, they were not asked for them again.

Although this procedure was generally effective (a mean of 1.6 cards returned by control subjects and 16.4, of 24, by experimental subjects), the procedure was changed for the 1987/88 academic year. These changes were precipitated by input from the staff at Des Moines. Concerns included issues regarding the validity of obtained data, questions regarding the need for such frequent feedback, and the desire to increase the average 67% return rate. For the 1987/88 academic year, parent report of home activities was obtained twice for all subjects; once in early spring and once at the end of the school year. Questions were more extensive than those included on the postcard. The return rate of these questionnaires was over 90% on the first and almost 100% on the second administration. These data have not been analyzed for this report but will be available in October 1988.

Additionally, information was obtained at posttest on the amount of time each child spends in various activities/therapies such as day care, speech therapy, etc.

The data for the four most frequently occurring additional services, excluding religious activities, are presented in Table 13.6. No group differences were found.

A final major source of treatment verification information is a site review conducted annually by the site coordinator. A site review conducted on April 10, 1987 is reported in last year's annual report, and interested readers should refer to that report for further information. A second site review was conducted on May 10 and 11, 1988. The purposes of these reviews were to: (a) collect information about the nature and quality of early intervention services that are being delivered, (b) verify that the research being conducted by EIRI is being implemented as intended, and (c) collect assessment data that may be useful to site administrators to guide internal changes and for use when seeking technical assistance.

Purposes (a) and (b) are of primary interest in this report. The Des Moines School District was conducting the research as intended by EIRI. Overall findings indicated: The preschool program was of high quality. It was staffed by enthusiastic and qualified professionals. Classroom environments were safe and appropriate. Teachers emphasized functional skills in naturally occurring environments. The program was competently administered, utilized up-to-date curricula, and had proper evaluation, assessment, and progress procedures. Parent training sessions were well organized and well facilitated, and parent participation was good. (For more information, a copy of the site review can be obtained.)

Cost of alternative interventions. The cost analysis for this research study was conducted during the 1987/88 academic year. Costs for the center-based program (without parent training) are based upon the entire preschool program enrollment of 210 children. Cost for the parent training are based on one PIE class (n = 8) and one PIE II class (n = 14); these were the only parent training classes occurring during the 1987/88 year. Cost data for the center-based and PIE programs were obtained using the ingredients approach described earlier (see the cost section of this report). The approach includes resources such as direct service and administrative personnel, facilities, equipment, transportation, and materials and supplies. For the parent training, parent time and transportation expenses were included.

Estimates of parent travel time and transportation expenses were obtained by phone interview with 73% of parents involved in parent training. Transportation costs were:

$\bar{X}$ PIE = \$88.02

$\bar{X}$ PIE II = \$53.00

Parent time was valued at \$10.50/hour and estimates were based on parent attendance. Parent training costs for district personnel and materials were allocated at 60% for PIE and 40% for PIE II.

Table 13.7 presents the results of the cost analysis and per child costs where parent time and transportation are not included and with parent time and transportation included. These cost data indicate that parent training is not an excessive cost when added onto an existing program.

Table 13.7
Cost per Child for Des Moines (1987-88)

Resource	Center-Based Only N = 210)	Center-Based + Parent Training PIE I (N = 8)	PIE II (N = 14)
Agency Resources:			
Personnel Direct Service	$3,764.99	$5,136.63	$4,287.57
Administrative	1,367.78	1,367.78	1,367.78
Facilities	200.00	200.00	200.00
Equipment	12.33	12.33	12.33
Materials/Supplies	35.70	76.80	51.36
Transportation	479.04	479.04	479.04
Subtotal	$5,859.84	$7,272.58	$6,398.08
Contributed Resources:			
Parent Transportation	0	88.02	53.00
Parent Time (at classes)	0	173.25	97.88
Total	$5,859.84	$7,533.85	$6,548.96

Data Collection

It is important to note that the data collected for this study was collected to assess the effects of intervention not only on the children, but also on their families. A pretest-posttest group comparison format was used in this study.

The following procedures are completed at pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI). In a second pretesting session, which took place within 2 weeks of the BDI test session, parents (usually the mother) completed the following family measures: the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES). Parents were paid a $20 incentive after both pretesting sessions were completed. (Married mothers and those with spouse equivalents were also given a copy of the Family Support Scale to take home for their husbands to complete.) These measures are considered core measures and are used at each of the EIRI research sites.

At posttest, a similar course of events occurred. The core battery, described above, was once again administered in two sessions. Additional tests and surveys were also administered (complementary measures); these varied slightly from the 1986/87 to 1987/88 academic year. These additional measures were individually selected at each site to allow possible site specific differences to be more clearly elucidated. Parents were paid a $40 incentive for completing the posttest battery.

Additional surveys completed both years by mothers included the CES-D Depression Scale, a Child Improvement (Locus of Control) Questionnaire, a test of knowledge regarding material taught in the PIE training, a parent satisfaction questionnaire, and treatment verification questionnaires. At posttesting of the 1987/88 year, mothers also completed the Parents as a Teacher Scale and the Comprehensive Evaluation of

Family Functioning. Mothers in the parent training groups also completed a satisfaction questionnaire specific to parent training. At all posttest sessions, mothers were administered a Peabody Picture Vocabulary Test (PPVT).

During the 1986/87 year, children were administered the Stanford-Binet Test of Intelligence (Form L-M) as an additional measure. After some analyses of data obtained from this test and consideration of costs to administer, this measure was dropped. As an additional measure for children, the Joseph Preschool and Primary Self-Concept Inventory was added.

Recruitment, training, and monitoring of diagnosticians. The Battelle examiners were doctoral candidates in the School Psychology program at Iowa State University and professionals in the community (i.e., speech and language therapists) not currently working full-time. Their training included an extensive inservice on BDI administration and scoring, and each examiner, after administering a minimum of three practice BDIs, was required to pass a quality control test administration before they were permitted to pretest. Further, each examiner was "shadow scored" at least once during pretesting and posttesting by the Des Moines site liaison (who is a school psychologist), and each examiner was videotaped once during pretesting so that their administration could be viewed and corrected, if necessary, by the EIRI assessment coordinator. Interrater reliability data reveal coefficients consistently above .90. All test protocols are also rescored by EIRI clerical staff and errors indicated. This rescoring has resulted in only minor errors being discovered, increasing confidence in the examiners. These examiners also administered the PPVT to mothers. This was done concurrent with the posttest BDI administration. None of the examiners had any other involvement with the Des Moines program, so the likelihood of their knowing to which group a child was assigned was remote.

All Stanford-Binets were administered by three trained doctoral candidates in the Psychology program from Utah State University. All Stanford-Binet examiners were uninformed about the subjects' group assignments. None of the Stanford-Binet examiners had any other involvement with EIRI or the Des Moines Public Schools, so the likelihood of their knowing group assignments was also remote. During the 1987/88 year, the Joseph Self-Concept Inventory was administered by two of the Battelle examiners. Both the Stanford-Binet and the Joseph were administered while the child was in his preschool classroom placement. All family survey measures were administered to the parents in groups by the Des Moines site liaison. Parents were not allowed to discuss their surveys prior to or during these sessions. This method of administration was selected to help ensure that Battelle examiners remained blind to subject group placement.

Pretesting. Pretest data were collected at the beginning of the academic year. The specific measures administered and procedures for administration have been detailed above.

First posttesting. The first posttesting is that posttest that occurs after the child has been involved in the study for one academic year. Posttesting occurred at the end of the academic year and consisted of the core and complimentary measures described above. As noted above, complementary measures varied slightly depending on the academic year the child was involved.

Second posttesting. The second posttest can be broken down into two groups; those children that remained in the preschool program for a second year and those children who moved into the Des Moines School District's school-age program. Each group will be discussed separately.

For those children that remained in the preschool program for a second year, the second posttest was similar to the first. The same package of core and complimentary measures described for the 1987/88 year was administered following the same procedures. Mothers were not re-administered the PPVT. Parents were paid $40 for their participation.

For children that have moved into a school-age program, slightly different procedures have been followed (follow-up procedures). Appointments were made with parents for them to bring their children in for testing during the summer. The test battery for the summer included the core and complementary measure for the 1987/88 year. Parents did not complete the Comprehensive Evaluation of Family Functioning or the parent satisfaction questionnaire, and PPVTs were not administered. Parents did complete a child information form and provided research staff with permission to talk with the child's teacher. Parents were paid $40 for their participation.

Follow-up procedures are partially completed on all but four subjects that left the preschool program. Attempts will be made to contact parents of these subjects in September 1988. Teachers of children involved in follow-up, from the 1987/88 year, will also be contacted and asked to complete an information form on each child and to complete the socialization and daily living skills domains of the Vineland Adaptive Behavior Scales. Teachers will be paid for participation (approximately $10/child).

Future posttesting. The nature of this research is longitudinal and future posttesting will occur. It is expected that future posttesting will be similar to the second posttest. Feedback based on current procedures will be obtained and this feedback could affect procedures. Major changes are not expected.

Results and Discussion

This research study is examining the question of the effectiveness of parent training when added onto an already existing, well-developed center-based intervention program. The focus of this section will be on those subjects that have completed one full year of intervention (all 1986/87 and newly enrolled 1987/88 subjects). Parent training group subjects for this analysis have been involved only in PIE I. It should be made clear that these results are not final, analyses are continuing. These continuing analyses along with the longitudinal data will allow for a finer understanding of this research issue.

Comparability of Groups on Pretest Measures

Based on available demographic data (presented earlier in Table 13.1), there is a slight advantage for those subjects whose parents are involved in parent training (experimental group). The experimental group families are better educated, hold higher SES occupations, and have a higher annual income.

Additional information on the comparability of groups is presented in Table 13.8. This table presents data from the core measures at pretest for the no parent training and parent training groups. On the BDI, there is a slight advantage in favor of the no parent training group subjects in the adaptive and motor domain areas ($p < .10$).

On three of the family measures, significant differences were found between the groups. Based on the FACES, families of the no parent training group subjects are functioning further from the "ideal" norm than families in the parent training group. This is occurring on their total FACES score as well as on the adaptation scale. The results of the FILE indicate that the families of subjects in the parent training group have had more major life events occur in the past year than families in the control group. In contrast, scores from the Family Support Scale indicate that families in the parent training group have more sources of support.

Although the families differ on these three measures, their stress ratings (based on the PSI) are not different. Also, resources available to each family by group are roughly comparable. Current knowledge of family functioning makes it difficult to interpret the effect these different patterns may have on subject or family functioning as a result of intervention.

Effects of Alternative Forms of Intervention

The following section will analyze the effects of the alternative forms of intervention on child and family functioning, and examine some site specific analyses. In addition, an indication of progress toward other analyses will be provided.

Table 13.8

Comparability of Groups on Pretest Measures
for Des Moines Parent Training Study

All Subjects Included in Analysis

Variable	No Parent Training			Parent Training			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Battelle Developmental Inventory (BDI)* DQs for:							
Personal Social	69.1	(21.2)	42	67.5	(18.5)	34	.73
Adaptive Behavior	70.5	(17.0)	42	63.0	(22.1)	34	.06
Motor	71.4	(18.6)	42	62.6	(22.0)	34	.08
Communication	60.2	(16.3)	42	57.5	(20.6)	34	.52
Cognitive	65.0	(17.2)	42	68.9	(19.6)	34	.94
TOTAL	66.3	(14.0)	42	62.6	(16.7)	34	.29
• Parenting Stress Index (PSI) Δ							
Child Related (range 30 to 250)	118.90	(20.4)	41	117.35	(18.4)	34	.73
Other Related (range 54 to 270)	131.34	(23.73)	41	131.56	(28.8)	34	.97
TOTAL (range 101 to 505)	250.24	(40.1)	41	248.91	(43.3)	34	.89
• Family Adaptation and Cohesion Evaluation Scales (FACES)†							
Adaptation (range 0 to 24)	9.68	(6.2)	41	5.71	(4.4)	34	.002
Cohesion (range 0 to 30)	8.32	(6.2)	41	6.56	(5.4)	34	.20
TOTAL (range 1 to 54)	18.0	(8.9)	41	12.26	(7.3)	34	.004
• Family Resource Scale (FRS)∞ (range 30 to 150)	118.83	(14.8)	41	116.26	(19.5)	34	.52
• Family Index of Events (FILE)∞ (range 0 to 71)	8.1	(4.8)	41	12.0	(8.0)	34	.02
• Family Support Scale (FSS) Total Score ΔΔ (range 0 to 4)	1.8	(0.7)	40	2.2	(0.8)	33	.06

NOTES: * Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (See Appendix A for details).

∞ Analyses for the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

Δ Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

ΔΔ Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

Measures of Child Functioning

Results of posttest data analysis on child functioning are presented in Table 13.9. Results presented for each measure in the table are based on an analysis of covariance completed using SPSS-PC. Treatment group served as the independent variable, and the dependent variables were scores obtained from the core measures. Covariates were selected from pretest measures or demographic characteristics. To

Table 13.9
Posttest Measures of Child Functioning for Alternative Intervention Groups for Des Moines Parent Training Study

		No Parent Training				Parent Training						
Variable	Covariates#	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES$^{\Delta}$	P Value
Average length of intervention in month&	–	9.0	---		42	9.0	---		34	---	---	—
Age in months at posttest	–	59.9	(11.7)		42	59.3	(11.6)		34	.05	-.05	.82
Battelle Developmental Inventory (BDI)*												
Personal-Social	1,7,8,10,12	72	(19)	73	38	67	(20)	67	33	-.19	-.03	.66
Adaptive Behavior	2,7,8,10,12	68	(18)	65	38	66	(25)	69	33	2.0	.22	.17
Motor	3,7,8,10,12	74	(19)	71	38	66	(23)	69	33	-.54	-.11	.47
Communication	4,7,8,10,12	6.1	(15)	61	38	60	(20)	60	33	.53	-.07	.47
Cognitive	6,7,8,10,12	69	(15)	68	38	66	(20)	66	33	1.88	-.13	.18
Total	6,7,8,10,12	68	(14)	67	38	64	(19)	65	33	-.44	.14	.51

NOTES: * Statistical Analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

Δ Effect Size (ES) is defined here as the difference between the groups (Parent Training minus No Parent training) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the No Parent Training Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size).

& All subjects in analysis were in intervention for entire academic year.

Covariates: 1 = BDI personal-social; 2 = BDI adaptive; 3 = BDI motor; 4 = BDI communication; 5 = BDI cognitive; 6 = BDI total; 7 = Mother age; 8 = Mother education; 9 = FACES adaptation; 10 = FACES total; 11 = FSS total; 12 = FILE.

determine covariates, correlations between dependent variables and possible covariates were conducted. Measures found significantly correlated with the dependent variable were placed in a multiple regression that used the ANCOVA dependent variable as an independent variable. Measures found significant in the multiple regression were used as covariates. In addition, pretest and demographic measures where significant differences were found were also included as covariates. Child functioning in Table 13.9 is represented by measures from the BDI. None of the BDI domains approached significance.

Parent attendance at parent training meetings may effect the intervention outcomes. Where parent attendance varied greatly in this study (see earlier section), the Analysis of Covariance was repeated using only parents that attended parent training sessions more than 50% of the time. This analysis had little impact on the initial child functioning findings. No differences occurred between the groups on the BDI measures after controlling for parent attendance.

Measures of Family Functioning

Table 13.10 presents data on parent and family functioning as assessed using the core measures. Analysis procedures described for Table 13.9 were repeated in producing this table. Of these analyses, no significant differences between groups was found.

The analysis using parents that attended parent meetings greater than 50% of possible sessions was also conducted on measures of family functioning. This analysis did not effect the trends observed on the measures of parent and family functioning as reported in Table 13.10. One area of family functioning that should be noted are those measures dealing with parent stress (the PSI). Initial results from this site suggested that involvement in parent training groups may increase parent stress levels (see the 1986/87 EIRI annual report). This result was not found using this larger group. Stress factors were found to be equal for both groups.

Table 13.10
Posttest Measures of Family Functioning for Alternative Intervention Groups for Des Moines Parent Training Study

Variable**	Covariate#	No Parenting Training					Parent Training					ANCOVA F	ES$^{\Delta}$	P Value
		$\overline{X}$	(SD)	AdjX	%	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%	n			
Parent Stress Index (PSI) $^{\$}$														
Child Related	1,8,9,10,11	116.8	(20.0)	115.9	85	37	113.0	(18.6)	113.9	80	33	.25	0.1	.62
Other Related	2,8,9,10,11	134.2	(25.3)	134.2	72	37	128.0	(24.9)	128.0	63	33	2.45	.25	.12
Total	3,8,9,10,11	251.0	(41.3)	251.0	81	37	241.0	(37.9)	242.1	73	33	1.44	.22	.23
Family Support Scale (FSS)*	4,8,9,10,11	24.7	(10.1)	26.0	45	35	30.4	(8.5)	29.1	54	32	2.08	.31	.16
Family Resource Scale (FRS)$^{\infty}$	5,8,9,10,11	121.3	(16.1)	119.6	54	37	118.1	(19.0)	118.1	50	33	.00	-.09	.98
Family Adaptation & Cohesion Evaluation (FACES)†														
Cohesion	3,6,8,9,10,11	8.4	(6.7)	7.9		37	7.8	(6.3)	8.4		32	-.08	-.07	.78
Adaptation	7,9,10,11,12	9.1	(6.5)	7.7		37	8.1	(6.0)	9.5		32	1.25	-.28	.27
Total	2,8,9,10	17.5	(9.2)	16.0		37	15.9	(8.5)	17.5		32	.50	-.16	.48
Famly Inventory of Life Events (FILE)$^{\$}$	8,9,10,11	7.5	(5.5)	8.8	47	37	10.3	(6.3)	9.0	47	33	.05	-.04	.83

$^{\Delta}$ Effect Size (ES) is defined here as the difference between the groups (Parent Training minus No Parent Training) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the No Parent Training Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, FACES, and FILE, the difference between the groups for the ES (numerator) is calculated by subtracting the adjusted scores as No Parent Training minus Parent Training Group, because lower scores are preferred.

* Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A).

$^{\$}$ Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

$^{\infty}$ Analysis for the FRS is based on raw scores where higher scores indicate greater resources.

** Although analyses were based on raw scores, percentile information is presented for ease of interpretation on the PSI, FRS, and FILE. Percentile information is based on the adjusted raw score and was obtained from data collected across all EIRI longitudinal studies for the FRS and FSS. Percentile information for the PSI and FILE are based on the authors' normative sample.

Covariates: 1 = PSI Child; 2 = PSI Other; 3 = PSI Total; 4 = FSS; 5 = FRS Total; 6 = FACE Cohesion; 7 = FACE Adaptation; 8 = FACE Total; 9 = FILE; 10 = Mother Age; 11 = Mother Education; 12 = Child Age at Pretest.

Treatment Verification Analyses

An initial analysis of the treatment verification data was conducted. The finding of group differences on the intervenor rating of parents (Table 13.6) raised questions regarding the reason for this difference. That is, did the parent training provide parents with skills that enabled them to interact more effectively with teachers or were the ratings the result of other factors (as pretest differences did exist between groups)? The relation of parent attendance at group meetings (by parent training group subjects) and parent satisfaction with intervenor ratings were other issues that were of interest.

Correlational analyses were conducted to begin the examination of these issues. Correlations of parent attendance (by parent training group parents), intervenor ratings of parents (for all parents), and parent satisfaction (for all parents) with treatment verification measures, family demographic characteristics, and information from posttest family measures were conducted. Correlations with the family measures and the majority of demographic characteristics revealed no significant correlations. The data presented in Table 13.11 represent those correlations that provide some interesting findings regarding the current data and raise suggestions for further analyses.

Intervenor ratings of parents appear influenced by a number of factors, primarily parent education and income, although child attendance at school and lack of child progress in school also affected intervenor ratings. When these demographic factors were included in an Analysis of Covariance with intervenor rating (sum of the three areas) as dependent variable and treatment group as independent variable, no differences between groups were found (F = 2.46, ES = 0.38, p = .13).

Parent education and income also affected parent attendance at parent training meetings. Perhaps parents with higher levels of education are more comfortable in a class-like setting and are more willing to attend regularly. Unlike parent attendance

Table 13.11

Correlational Analyses of Treatment Verification Data for Des Moines Parent Training Study

Variable	Parent Attendance$^{\&}$		Intervenor Rating $^{\Delta}$		Parent Satisfaction$^{\#}$	
	r	*p*	*r*	*p*	*r*	*p*
• Mother's education	.32	.07	.56	<.000	.11	.25
• Father's education	.37	.05	.51	<.000	-.03	.41
• Family income	.42	.03	.61	<.000	.15	.17
• Child school attendance	.22	.10	.23	.06	.04	.40
• Parent attendance$^{\&}$	---	---	.55	.002	.00	.50
• Intervenor rating$^{\Delta}$	.55	.002	---	---	.06	.33
• Parent satisfaction $^{\#}$	.00	.50	.06	.33	---	---
• Child progress$^{\infty}$	-.12	.26	-.20	.06	.04	.38

$^{\&}$Parent attendance at meetings for parent training group subjects only.

$^{\Delta}$ Sum of support, knowledge, and attendance ratings.

$^{\#}$ Sum of seven parent satisfaction questions.

$^{\infty}$Child progress is a gain score obtained from subtracting the Battelle total raw score at pretest from the Battelle total raw score at posttest.

at meetings and intervenor ratings, parent satisfaction with the center-based intervention program appears unaffected by parent education, child progress, or intervenor perception. A number of possibilities arise: (a) more sensitive measures of satisfaction may be needed; (b) parents may not have a clear idea of what represents a good versus poor program; or (c) parents may be truly satisfied.

These treatment verification analyses raise interesting questions for the field of early intervention. Evaluations in the past have overlooked these variables and as a result may have obtained biased data (Casto & Mastropieri, 1986; Cooke & Poole, 1982). These initial analyses make clear the importance of verification data. Verification data cannot only help clarify results obtained, but also raise new areas for investigation.

Continued analyses. A variety of analyses will be completed in the near future, and are not included because the data are not ready for analysis. Analyses using the complementary measures have not been conducted. Analyses on children involved in the program for more than 1 year and for those that were in school-age programs also need to be conducted.

Conclusions

This study is investigating the effect on children, parents, and families of placement in a center-based early intervention program with a parent training component compared to placement in the same program without parent training. Results to date suggest that parent training does not have a positive effect on the behavior of children or functioning of families. These results are not without problems, parent attendance at parent training meetings was marginal. Although these results should be considered tentative at this point, it does appear that this type of parent training may not be an efficacious intervention strategy. This is not implying that parents cannot be effective interveners, research has shown they can be, but only that parent training added onto an already intensive intervention program does not produce additional measurable benefits. Continued analyses will determine if this conclusion is correct.

Future Plans

The subject pool is complete at this time. Future activities involve the continued follow-up of children and families who have been involved in this research. Posttesting is scheduled to occur at the end of the 88/89 and 89/90 academic years. Research efforts will be directed toward minimizing attrition and obtaining posttest data. Other activities will focus on data analysis.

UTAH PARENT INVOLVEMENT STUDY (1986)
Project #14

Comparison: Moderately to Severely Handicapped Children--Center-based intervention plus parent training versus center-based intervention only.

Local Contact Person: Leon Soderquist, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Marcia Summers

Location: Salt Lake City, Utah

Date of Report: 10-8-1988

Rationale for Study

While parents are often involved in their handicapped child's programming prior to age 3, there is a tendency to exclude parents as the child grows older. The recent passage of PL 99-457, with its specific mention of individual family plans, is an obvious attempt to address the need for more meaningful involvement for the families of young handicapped children. Unfortunately, currently available research does not provide information about the effects and costs of developing and implementing family plans.

No program of involving parents has yet been identified as being clearly the best. However, parent training is frequently used as one way in which to include parents in their children's education. Theoretically, parent training should produce child gains as parents and teachers become more effective partners working together on behalf of the child.

This study investigated the immediate and long-term effects of a parent training program which was primarily designed to improve parents' skills as teachers of their handicapped child. Secondarily, it benefitted parents by providing them with a forum which allowed them to form liaisons and seek support from other parents with handicapped preschoolers. In addition to assessing the impact of parent training with child progress measures, this study assessed the possible changes that this training had on the family. The work of several investigators has suggested a link between child management skills and family functioning (e.g., Koegel, Schreibman, Britten, Burke, & O'Neil, 1982; Patterson, 1980; Patterson & Fleishman, 1979; Wahler, Leske, & Rogers, 1979); however, additional research is needed to determine the nature of these effects. Additionally, most previous studies were conducted with disadvantaged children; moderately and severely handicapped children may present sufficiently different problems so that the relationship between behavioral parent training and overall family functioning may not be present or at least may be different.

This study is very similar to the Utah Parent Involvement 1986 study; it is also very similar to the Des Moines study. This study differs from the Des Moines study in that the children in this study are younger than those at Des Moines and DDI is a private non-profit agency while the Des Moines study is being conducted at a public school. This study is identical to the Utah Parent Involvement 1986 study in its methodology, although slight differences in the instruments used in assessment may be found. (For example, a measure of home environment called the HOME is used in the Utah Parent Involvement 1985 study, but not in the Utah Parent Involvement 1986 study.) For the most part, however, the Des Moines and Utah Parent Involvement 1985 and 1986 studies are the same procedures and methods of assessment. These three studies provide a systematic and concurrent replication of each other. The literature on parent involvement has been severely criticized for the lack of replication and limited generalizability of its studies (Clarke-Stewart, 1982). The use of a second cohort of children at Developmental Disabilities Incorporated also helps to control for one threat to internal validity (history).

Review of Related Research

The involvement of parents in their children's education has long been considered important. Founded upon a belief in the importance of parent-child interaction and built on the idea that families were the primary source of values and behaviors of children, parent involvement has been seen by many social scientists, practitioners, and advocates as a way to solve a variety of societal problems. The Head Start program, which served as a guide for many subsequent early intervention projects, included a parent involvement component as an integral part of its activities. Bronfenbrenner's (1974) report was especially influential in arguing that early intervention with disadvantaged children was more effective when parents were involved in the program, asserting that the increased participation of parents provided the value change that led parents to encourage and reward their children's learning activities. Lazar's (1981) analysis of 14 studies of early intervention for disadvantaged children with follow-up data reaffirmed this contention in finding that direct participation of parents, "the more, the better", was significantly related to positive program outcomes. Polls of general public opinion have also demonstrated that parents want more participation in their children's education (Gallup, 1986).

The benefits associated with parent involvement are believed to be well established both for normal and disadvantaged children. IQ gains and fewer special education placements have been frequently cited in the literature. Haskins and Adams (19 , p. 364), in a critical review of parent education, concluded, "Even a conservative interpretation would indicate that parent intervention programs can, under some circumstances, produce long-term IQ gains in children." Children's sociability and cooperation may also show significant gains (Clarke-Stewart, 1982). Increased infant responsiveness, improvement in children's school performance, and positive effects on maternal behavior (more facilitative language, flexible childrearing patterns, awareness of parental role as educator) have also been found (Powell, 1986). Some of these effects would appear to be long-lasting; for example, one study found that the Yale Child Welfare parent involvement program still had a positive impact on family circumstances ten years after the intervention had ended

(Seitz, Rosenbaum, & Apfel, 1985). Another study found that children of parents involved in long-term parent training programs were less likely to be enrolled in special education classes 7 years after the conclusion of the intervention (Jester & Guinagh, 1983). However, Clarke-Stewart, and Apfel (1979) have cautioned that although immediate effects are achieved in general, most follow-up studies show effects are not permanent or very long-lasting. The controversy over the endurance of benefits associated with parent training points to the need for more longitudinal research in this area.

The research discussed thus far has generally been conducted with disadvantaged children. Because such programs have been considered to be effective with this population (and with more general populations as well), it was logical to extend them into use with families of handicapped children. The number of self-help groups formed by parents of handicapped children would seem to support a felt need for assistance to parents in this area. The recent passage of PL 99-457, which mandates involvement of the family in the young child's education, also asserts the federal government's acceptance of the belief that effective education of the child must include the child's family. Parent education and training programs are a frequently used means of attempting to involve families and provide opportunities for parents to learn to work effectively with and for their handicapped children. As Foster, Berger, and McLean (1981, p. 55) noted, "Parent involvement is a good idea that has become an essential and often unquestioned component of intervention programs for young handicapped children." Unfortunately, as this quote implies, there is a dearth of methodologically sound studies concerning the effects of parent involvement with handicapped children.

Furthermore, research with parent involvement more generally is fraught with methodological problems. Clarke-Stewart has pointed out how most positive results in parent education are derived from a few exemplary programs, for which evaluation has been simplistic. Generalization to more average programs is questionable, especially given the dearth of replication of studies of parent education.

Other methodological problems are also noted by Clarke-Stewart. Often, no control or comparison group is used, and random assignment is almost never featured, giving rise to questions about selection effects. Little treatment verification has taken place in order to confirm that treatment was received by the parent as it was intended by the researcher. Furthermore, most studies focus on child outcome measures without taking into account that families are as likely to be affected. Clarke-Stewart suggests that perhaps parent training may serve to make the mother more anxious or unsure, and failure to measure maternal variables would obscure this result. In addition, many researchers have argued that the benefits of parent training are greater than those demonstrated by IQ gains for the target child, since carryover benefits to other family members are highly likely. Unfortunately, there is little data to support this claim.

One last highly important question concerns the focus of the parent training programs. It is not clear that parent-focused programs are significantly more effective than programs that work primarily with the child (Clarke-Stewart & Fein, 1983). For example, would a center-based preschool program alone be as effective as the same program plus a parent training component? Zigler and Berman (1983) have stated that this unresolved question is one of the major issues faced by early intervention professionals today.

Given the problems in the research in the field, it is not surprising that the value of parent involvement programs has been questioned. Powell (1986) has stated that, "Despite the recent growth and a long history of parent education, the value of parent programs continues to be questioned by many policy makers, funding agencies, and even some parents the programs wish to serve." It is clear that what is needed in this area is a well-designed longitudinal study that involves replication, random assignment to treatment and control groups, treatment verification, and multiple measures of child and family functioning in order to begin to address the numerous questions concerning the costs and effects of parent involvement.

Overview of Study

The long-term effectiveness of parent training was investigated in this study. Forty moderately to severely handicapped children were followed over a two-year period (21 in the parent training group and 19 in the comparison group). All children were involved in a center-based preschool program. Parents in the parent training program also took part in the Parents Involved in Education (PIE) program, which consisted of fifteen 1-1/2 hour weekly training sessions in January through April 1987. All children were tested prior to, immediately after, and one year following the implementation of the parenting groups. Parents also completed measures of family functioning. Results showed that no important differences were apparent at the time of posttest, either in measures of child or family functioning. However, at one year following the training, significant differences in child functioning were found in favor of the parent training group. The relationship between parent attendance in the training group and child developmental gain was generally found to increase over time.

Method

Subjects

Children, and their families, who were participating in classes taught by any one of six teachers through DDI's services for handicapped preschoolers were considered for inclusion in this study. Parents of these children were sent a letter inviting them to participate in the research, to which 66 responses were received. Eight of these parents were unable to participate due to reasons such as lack of transportation, illness, etc. Thus, 58 subjects were included in the study. This inclusion was based on parents' willingness to participate without prior knowledge of treatment group assignment.

Recruitment. Subject recruitment for this cohort was completed in November 1986. Fifty-eight students were originally recruited to participate in the study. However, for reasons such as parent job transfer, discontinued enrollment at DDI, parent refusal, etc., 18 original study recruits have dropped out of the study at the time of the second posttest.

Attrition. Two subjects dropped between the time of the pretest and the post test. Both were in the non-parent training group. One of these subjects cited the birth of a new baby and a language barrier (the subject was a recent immigrant) as the reasons for dropping out of the study and out of services altogether. The other subject dropped out of the study because the mother decided to withdraw her child from services at DDI. Thus, the sample at posttest time consisted of 56 subjects, of which 29 were in the parent training group and 27 were in the comparison group.

At the time of this report, data from 40 subjects were available for the analysis of second posttest testing. Two subjects dropped from the study immediately after the posttest, and efforts to recruit them back into the study proved fruitless. Additionally, 7 subjects dropped from the study at the time of second posttest due to lack of interest, and 1 subject declined to participate due to the death of the husband the week before the second posttest testing. (Conciliatory letters were sent to these subjects, expressing appreciation for past participation and best wishes for the future.) Two subjects moved, one to El Paso and one to Nevada, and we were unable to locate 3 other subjects. (Standard procedure for locating lost subjects is first, to contact next of kin, and second, to send a certified letter. For these cases, neither procedure proved successful.) Incomplete data was available on one subject, which are currently being collected. Thus, second posttest data was available for 21 subjects in the comparison group and 19 subjects in the parent training group.

A comparison of the subjects who remained in the study at the time of the second posttest with those who had dropped between the first and second posttest may be found in Tables 14.1 and 14.2. A few differences may be noted. There is a trend for parents of sons to have a greater drop-out rate than parents of daughters ($p=.078$). In addition, families that remain in the study are less balanced in terms of family cohesion, as measured by the FACES ($p = .061$). Research in counseling psychology suggests that clients who feel more dependent on the therapist rate the therapist higher and are more likely to remain in therapy. A similar phenomenon may be occurring here, in that families who are less balanced may feel a greater need for the information we provide to them in terms of their child's progress and thus are more likely to remain in the study. Given that the ultimate purpose of the research is to benefit the lives of handicapped children and their families, less balanced families may be more motivated to continue participation than are the other families.

No other statistically significant differences between the group that dropped and the group that remained in the study were found. Considering that more than 34 comparisons were made, it would not be surprising to find two "trends" towards statistical significance even if the groups were completely equivalent. Thus, while mortality poses some threat to the generalizability of the findings of the study, this threat is considered to be minimal.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups. Prior to the initiation of treatment, parents were either assigned to a group in which they received additional training or to a group in which parents received no additional training. The group not receiving

Table 14.1

Comparability of Groups on Demographics at Pretest for DDI 86 (Attrition)

	In Study			Dropped Out			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 11/15/86	41.0	(13.0)	40	44.3	(7.3)	16	.23
• Age of mother in years	32.9	(5.8)	40	32.3	(5.7)	16	.72
• Age of father in years	34.4	(6.3)	39	36.4	(6.3)	16	.29
• Percent male*	42.5		40	68.8		16	.08
• Years of education for mother	13.8		40	12.6		16	.12
• Years of education for father	14.0		40	13.7		16	.63
• Percent with both parents living at home*	87.5		40	81.3		16	.55
• Percent of children who are Caucasian*	100.0			100.0			1.00
• Hours per week mother employed	5.0	(11.5)	39	10.1	(12.4)	14	.17
• Hours per week father employed	41.0	(17.3)	34	35.5	(20.1)	10	.40
• Percent of mothers employed as technical managerial or above*	5.0		40	12.5		16	.43
• Percent of fathers employed as technical managerial or above*	45.7		35	25.0		16	.17
• Total household income+	$22,087	(25,036)	40	$25,035	(19,897)	14	.61
• Percent receiving public assistance*	32.5		40	43.8		16	.44
• Percent with mother as primary caregiver*	100.0		40	100.0		16	1.00
• Percent of children in day care more than 5 hours per week*	7.5		40	6.3		16	.87
• Number of siblings	2.3	(1.6)	40	1.9	(1.1)	16	.47
• Percent with English as primary language*	100.0		40	100.0		16	1.00
• Maternal PPVT (standard)	99.5	(17.7)	40	99.4	(17.0)	15	.98

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those children or families not possessing the trait were scored "0."

+ Income data were converted from categorical to continuous data by using the midpoint of each category.

Table 14.2

Comparability of Groups on Child and Family Functioning for DDI86 (Attrition)

Variable	In Study				Dropped Out				P Value
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	
• Battelle Developmental Inventory (BDI)[*] DQs for:									
Personal Social	66.0	(17.8)		40	60.2	(29.3)		16	.46
Adaptive Behavior	64.1	(13.6)		40	53.4	(23.8)		16	.11
Motor	57.7	(20.7)		40	48.6	(28.3)		16	.19
Communication	54.7	(18.3)		40	51.8	(23.1)		16	.62
Cognitive	60.3	(19.5)		40	53.5	(24.9)		16	.29
TOTAL	60.6	(13.2)		40	53.9	(22.4)		16	.28
• Parenting Stress Index (PSI)[@Δ]									
Child Related (range 47 to 235)	120.1	(21.6)	88	38	117.9	(20.6)	86	16	.72
Other Related (range 54 to 270)	136.1	(26.7)	74	38	130.4	(23.9)	66	16	.46
TOTAL (range 101 to 505)	256.2	(44.5)	84	38	248.3	(36.1)	78	16	.53
• Family Adaptation and Cohesion Evaluation Scales (FACES)[+]									
Adaptation (range 0 to 24)	7.2	(5.6)		40	5.3	(4.3)		16	.23
Cohesion (range 0 to 30)	9.1	(11.1)		40	5.1	(4.6)		16	.06
TOTAL (range 0 to 54)	16.3	(13.7)		40	10.4	(7.8)		16	.05
• Family Resource Scale (FRS)[&@]	113.9	(16.5)	41	40	112.4	(22.7)	39	16	.79
• Family Support Scale (FSS)[&@]	27.5	(10.2)	50	39	31.8	(10.3)	66	13	.20
• Family Index of Life Events (FILE)[@Δ]	12.1	(7.0)	29	40	10.9	(4.6)	34	15	.52

NOTES: [*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotients (DQs) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

additional parent training continued to receive the same level of training that was previously available through DDI's program for handicapped preschoolers.

In order to ensure the comparability of groups, subjects were assigned to groups randomly after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six possible mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their DQ test scores obtained from a number of assessment instruments previously administered as part of the eligibility process for receiving services at DDI.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination for the subject with the lowest DQ score, in each age X motivation cell was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups.

Demographic characteristics. Table 14.3 presents a demographic comparison of the parent training and non-parent training groups at pretest time. Twenty-nine subjects were in each group. The mean age for the children in the parent training group was 40.33 months and for the children in the comparison group was 43.71 months. P-values for the demographic variables ranged from .87 to .10, indicating that the groups were roughly comparable in terms of demographic characteristics and no significant differences were found between them.

Intervention Programs

The purpose of this study was to compare a center-based intervention group with a center-based intervention group whose parents participated in parent training sessions. A description of these treatments follows:

Basic intervention (DDI center-based treatment). Children in this treatment group attended an existing 1/2 day, 5-day-per-week intervention program. Small groups of 10-12 children were instructed by special education teachers who were assisted by paraprofessional aides. Instructional activities were developed from comprehensive assessments and items drawn from a number of curricula. In addition,

Table 14.3

Comparability of Groups on Demographics at Pretest for DDI 86

Variable	Center-Based Program			Center-Based + Parent Involvement			P Value	ES$^{\Delta}$
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		
• Age of child in months as of 11/15/86	43.7	(10.4)	29	40.3	(12.6)	29	.27	-.33
• Age of mother in years	33.5	(5.9)	29	31.8	(5.5)	29	.28	-.28
• Age of father in years	33.8	(6.1)	28	33.9	(6.3)	29	.25	.01
• Percent male*	44.8		29	55.2		29	.44	
• Years of education for mother	13.7	(1.7)	29	13.1	(2.3)	29	.28	-.35
• Years of education for father	13.7	(2.1)	29	14.1	(2.2)	29	.50	.18
• Percent with both parents living at home*	79.3		29	93.1		29	.13	
• Percent of children who are Caucasian*	100.0		29	100.0		29		
• Hours per week mother employed	8.1	(13.5)	27	5.8	(10.6)	28	.48	-.17
• Hours per week father employed	42.6	(15.1)	22	37.1	(19.3)	24	.29	-.36
• Percent of mothers employed as technical managerial or above*	10.3		29	6.9		29	.64	
• Percent of fathers employed as technical managerial or above*	42.3		26	37.0		27	.70	
• Total household income+	$22,352	(12,606)	27	$22,982	(15,432)	28	.87	-.05
• Percent of income spent on unreimbursed med./ education for child	6.8		21	3.1		19	.16	
• Percent receiving public assistance*	24.1		29	44.8		29	.10	
• Percent with mother as primary caregiver*	100.0		29	100.0		29		
• Percent of children in day care more than 5 hours per week*	10.3		29	3.5		29	.31	
• Number of siblings	2.1	(1.7)	29	2.2	(1.1)	29	.79	.06
• Percent with English as primary language*	96.6		29	100.0		29		
• Maternal PPVT (standard)	100.3	(17.9)	27	98.7	(17.1)	28	.73	-.09

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those children or families not possessing the trait were scored "0."

+ Income data were converted from categorical to continuous data by using the midpoint of each category.

$$ES^{\Delta}\frac{\text{Parent Involvement }\bar{X} - \text{Center-Based }\bar{X}}{\text{Center-Based SD}}$$

language and motor therapists provided individualized motor, speech, and language instruction to the children. These therapists also assisted teachers and paraprofessional aides with implementation of these activities. For in-depth discussion of training, and a description of a typical day, see the 1986-87 annual report.

Expanded intervention (DDI center-based plus parent training). In addition to the DDI center-based treatment described above, parents of subjects in the experimental group participated in a training program based on the Parents Involved in Education (PIE) training package. These PIE training sessions were taught by a DDI social worker and the Director of DDI. The average group size consisted of between 8 and 12 parents. Training sessions consisted of 15 ninety-minute sessions, once per week excluding holidays for a period of four months. In addition to the information provided, PIE training sessions offered an opportunity for parents to form support networks and discuss challenges associated with parenting a handicapped child. (Refer to 1986-87 annual report for further discussion of the experimental group training.)

Treatment verification. A number of procedures were implemented in order to provide an independent verification of the intervention program. Child attendance at the center-based program was recorded daily and sent to EIRI on a monthly basis. It can be seen in Table 14.4 that child attendance exceeded 85% for both the parent training and comparison group, but that the attendance of the comparison group was slightly higher. This may be due to the fact that the children of the parent training group was somewhat less healthy, as reflected by the lower child health rating of this group ($\bar{X}$ = 1.93) than the comparison group ($\bar{X}$ = 2.00).

Parent attendance data (for the parent training group) was recorded weekly; these data were also sent to EIRI on a monthly basis. Mean parent attendance was 59% (SD = .26). A description of quality of parent involvement was also gathered annually by the direct intervenor who worked most closely with the child's mother.

Table 14.4

Other Comparisons -- Posttest #1 -- DDI86

Variable	Center-Based Program			Center-Based + Parent Involvement			P Value	ES$^{\Delta}$
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		
o Parent knowledge	14.0	(5.7)	27	17.9	(5.5)	29	.01	
o Child's school attendance (%)	90.6		27	86.0		29	.08	
o Teacher rating of parent's:								
Attendance	2.5	(.85)	27	2.7	(.54)	25	.31	.24
Support	2.2	(.93)	27	2.6	(.58)	25	.12	.36
Knowledge	2.3	(.95)	27	2.4	(.65)	25	.53	.15
o Time parents spend with program staff	172.9	(170.1)	29	79.9	(78.2)	29	.01	-.55
o Time parents spend working with child in suggested activities (minutes)	212.0	(196.1)	29	166.6	(211.8)	29	.40	-.23
o Parent ratings of educational services								
Staff	3.4	(.51)	27	3.5	(.57)	29	.98	.02
Communication	3.3	(.62)	27	3.4	(.63)	29	.63	.13
Child's goals/activities	3.3	(.53)	27	3.3	(.65)	29	.92	.02
Opportunity to participate	3.2	(.64)	27	3.6	(.51)	29	.04	.52
Range of services	3.1	(.68)	27	3.2	(.68)	29	.47	.21
Program in general	3.2	(.53)	27	3.3	(.61)	29	.21	.36
o Additional hours outside services	90.4	(199.7)	27	102.2	(173.6)	29	.81	.06

$$ES^{\Delta}\ \frac{\text{Parent Involvement } \bar{X} - \text{Center-Based } \bar{X}}{\text{Center-Based SD}}$$

The data obtained was the intervenor's perception (low[1], average[2], high[3]) of how a parent rated on attendance, knowledge, and support. While the mean ratings for these variables tended to be high (2.62 for attendance, 2.37 for knowledge, and 2.36 for support), nearly half the sample ranked as low or average on one or more of these categories, indicating that interveners were discriminating in the ratings they applied. Both parent attendance and intervenor ratings of the parents are typical of the situations experienced by many early intervention professionals who work with parents (Lochman & Brown, 1980).

Additionally, parents in the parent training group were asked to submit 20 weekly postcards which indicated the amount of time they spent doing instructional activities with their child. Parents in the non-parent training group were asked to submit postcards for only three separate weeks during the year. Parents in the parent training group were also asked to submit data records of the home intervention programs they designed based on their PIE training. Unfortunately, return rates for both groups tended to be low, hovering around the 50% range. These low return rates jeopardize interpretation of the data thus obtained. Other studies have used other methods, such as phone interviews, which have had similar problems. It appears that an effective means of assessing treatment verification remains to be developed.

While the amount of time parents spent working with their children in parent training types of activities is unclear, it is apparent that the parents in the training group learned the material that was presented to them. It can be seen in Tables 14.4 and 14.5 that the test of parent knowledge scores were significantly higher for the parent training group both at first and second posttest time. In fact, there was no decline in mean scores for either group between posttests. This information indicates that parents in the parent training group retained the information taught them in the parent training classes.

Finally, it should be noted that while no site review was conducted this year because this study has entered its follow-up phase, the previous site review found that the only notable difference between the parent training and the comparison groups was that the experimental group received the parent training and support. Problems noted at that time with transition of the children into the public schools have been addressed, and the program is still providing appropriate, high quality services to handicapped children.

Cost of alternative interventions. It is important to determine the cost of adding a parent training component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish a parent program might be better spent elsewhere. Haskins and Adams (19) point out that

Table 14.5

Other Comparisons -- Posttest #2 -- DDI86

Variable	Center-Based Program			Center + Parent Training			P Value	ES$^{\Delta}$
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		
o Test of parent knowledge	15.0	(5.9)	20	19.1	(4.8)	17	.03	.70
o Parent ratings of educational services								
Staff	3.5	(.61)	20	3.6	(.61)	19	.69	.13
Communication	3.8	(.55)	20	3.4	(.70)	18	.08	-.65
Child's goals/activities	3.5	(.51)	20	3.4	(.51)	19	.86	-.06
Opportunity to participate	3.6	(.60)	20	3.7	(.48)	19	.63	.13
Range of services	3.1	(.69)	20	3.3	(.65)	19	.33	.31
Program in general	3.4	(.49)	20	3.4	(.68)	19	.92	.02
Child's progress	3.5	(.51)	20	3.5	(.84)	19	.91	-.06
o Teacher rating of parents:								
Knowledge	12.5	(3.5)	6	14.2	(3.4)	6	.42	.48
Support/Participation	15.8	(2.8)	6	16.8	(5.9)	6	.72	.29
Attendance	5.0	(.89)	6	4.5	(1.2)	6	.48	-.56
o % Children eligible for Special Education	100.0		6	100.0		5	---	---
o % Time in regular classroom	16.7		6	12.5		6	.85	
o % Time in self-contained classroom	83.3		6	47.2		6	.21	
o % Time in resource room	0.0		6	0.0		6	---	
o % Time in other classes classroom	0.0		6	20.0		6	---	
o Child's attendance % good	33.3		2	16.7		1	Not computed due to small sample size	
% excellent	66.7		4	83.3		5		

$^{\Delta}$ ES $\dfrac{\text{Parent Involvement } \bar{X} - \text{Center-Based } \bar{X}}{\text{Center-Based SD}}$

there is a great need for cost analysis in the area of parent education in order to provide evidence that such programs will justify their costs by increasing the productivity of parents, their children, or both, and/or reducing the necessity for larger investments in treatment programs at some later date. This study has addressed these issues in part, and will provide more conclusive answers as it follows these children through their school years.

Table 14.6 presents results which demonstrate that the addition of parent training is fairly inexpensive. (Methods for determining the average cost per child are more extensively discussed in the section of the costs of early intervention.) On the average, the addition of parent training to the center-based program only costs about $200 more per child. This is mostly due to increased personnel costs, although a small amount goes to supplies. Even when the value of contributed resources is added in, this difference is only about $425 per child. This makes parent training, especially where volunteer help is used, to be a relatively small investment for an already established center-based program. The question of the relative effectiveness of the parent training will be addressed in the results section.

Data Collection

Recruitment, training, and monitoring of diagnosticians. With the exception of one BDI tester, this project has used the same diagnosticians at all data collection points (pretest, posttest #1, and posttest #2). All of the diagnosticians have

Table 14.6
Cost Per Child for Developmental Disabilities Inc. (1987-88)

Resources	Center-Based Only (N = 174)*	PIE & Center (N = 29)
Agency Personnel		
Direct Service	$2,816.87	$2,979.10
Administrative	497.10	525.73
Consultants	45.98	45.98
Occupancy	511.46	511.46
Equipment	79.16	79.16
Transportation	14.37	14.37
Materials/Supplies	46.34	52.41
Miscellaneous	135.06	135.06
SubTotal	$4,146.34	$4,343.27
Contributed Resources		
Parent time	434.48	585.42
Parent Travel	1,293.11	1,369.52
Volunteer	25.71	25.71
Subtotal	$1,753.30	$1,980.92
Total	$5,899.64	$6,323.92

NOTE: * Sample size includes all children at DDI except those in the parent training group.

Master's degrees and extensive experience assessing handicapped infants and children. In addition, two of the three testers were enrolled in special education doctoral programs. Although these diagnosticians were aware that research is being conducted, they were "blind" to the specific details and hypotheses of the study. Shadow scoring was conducted on 10% of the administrations, and administration of the Battelle was determined to be reliable between testers at the 80% level.

Pretesting. Pretesting took place in late October and early November of 1986. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI), a measure of child's developmental level. The BDIs were administered by a trained examiner who was unaware of the child's group assignment. Testing occurred at the DDI center. In a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed the following family measures: the Parenting Stress Index (which measures stress and coping behavior in the parent-child system), Family Support Scale (assesses the availability and helpfulness of different sources of support to families), Family Resource Scale (measures the extent to which different types of resources are adequate in households with young children), Family Inventory of Life Events and Changes (assesses life events and changes experienced by a family unit), and the Family Adaptability and Cohesion Scales (assesses perceived and ideal levels of family functioning). Information pertaining to the reliability and validity of these measures may be found in the first annual report (White & Casto, 1986). Each of these two sessions lasted approximately 1-1/2 hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttesting #1. Initial posttesting occurred at the end of the school year during the last two weeks of May and the first week of June 1987, or approximately

7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery consisted of the same battery of tests and surveys as the pretest battery as well as some additional measures. For mothers the additional tests and surveys include the Peabody Picture Vocabulary Test (a measure of verbal intelligence), the CESD Depression Scale (measures depression), a survey of child health, a Child Improvement Locus of Control questionnaire (assesses parental beliefs about the factors controlling the improvement of their handicapped child), and a test of knowledge regarding PIE training. Children were given the Battelle and the MCDI, an additional measure of the child's developmental level. The posttest BDI and PPVT were administered by trained test examiners who were uninformed of subject's group assignments. Parents were paid a $40.00 incentive for completing the posttest battery. Additionally, mothers and children were videotaped for 16 minutes using a standardized protocol, and mothers were paid $10.00 for the videotaping session.

Posttesting #2. A second posttest was conducted on both treatment groups in June, 1988. (No monitoring of parental implementation of training principles took place between the first and second posttesting.) Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out various family measures. In addition to family measures, parents in both treatment groups completed a specially-developed questionnaire assessing the parents' satisfaction with DDI's preschool services. Parents of the experimental group were interviewed by an extensively trained staff regarding their knowledge of, and satisfaction with, parent training sessions. These parents were given the opportunity to comment on their treatment preferences based upon their experience with both DDI and PIE training sessions. They were also asked to discuss how their parenting techniques had changed as a result of the PIE, as well as how they handle stressful parenting. After the completion of both the BDI and parental measures and interviews, parents were compensated $30 for their time.

In addition to parental interviews, special permission was obtained to contact the teachers of study participants. These teachers were asked to complete a questionnaire developed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement.

As an incentive for the teachers to participate, two brightly colored and usable classroom posters were mailed along with the questionnaire. If a teacher was asked to complete more than one questionnaire, an appropriate number of posters was supplied with the use of these incentives. This questionnaire had a 98% return rate. (Only one questionnaire was not returned. It was learned that this teacher had recently moved out of the country.)

Results and discussion

This section discusses the comparability of parent training and non-parent training groups at pretest time, and will present the results of comparisons of the two groups in terms of child and family functioning at first and second posttest.

The questions which this analysis seeks to answer are:

1. What are the immediate and long-term effects of parent training on the young handicapped child and on the family system?
2. What is the relationship between parent training, child characteristics, and family characteristics?
3. Is the magnitude of the effect associated with the degree of parental participation, and how does time affect this relationship?

Comparability of Groups on Pretest Measures

Table 14.7 features comparisons of the original 58 subjects on pretest child and family functioning measures. Briefly, it may be seen that the groups do not differ significantly on any of the measures taken at this time. P-values range from .981 to .170, indicating that the groups may be considered comparable at the time of pretest.

Table 14.7

Comparability of Groups on Pretest Measures for DDI86 Study

Variable	Center-Based Program				Center-Based + Parent Involvement				P Value	ES
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n		
• Battelle Developmental Inventory (BDI)[*] DQs for:										
Personal Social	64.3	(21.7)		29	66.5	(21.2)		29	.75	.05
Adaptive Behavior	58.0	(17.3)		29	62.7	(18.1)		29	.32	.26
Motor	58.8	(21.7)		29	58.8	(25.1)		29	.17	.00
Communication	52.8	(19.9)		29	55.2	(19.7)		29	.64	.12
Cognitive	57.4	(21.7)		29	59.2	(20.6)		29	.75	.08
TOTAL	56.9	(16.4)		29	59.8	(16.8)		29	.50	.17
• Parenting Stress Index (PSI) Percentile Rank[@]										
Child Related (range 47 to 235)	121.5	(23.2)	89	29	118.3	(18.1)	87	29	.57	.13
Other Related (range 54 to 270)	133.3	(28.5)	71	29	136.2	(22.4)	74	29	.67	-.10
TOTAL (range 101 to 505)	254.8	(47.7)	83	29	254.5	(34.4)	83	29	.98	.00
• Family Adaptation and Cohesion Evaluation Scales (FACES)[†]										
Adaptability (range 0 to 24)	6.6	(5.6)		29	6.3	(5.2)		29	.87	.04
Cohesion (range 0 to 30)	8.6	(12.9)		29	6.9	(4.9)		29	.52	.12
TOTAL (range 0 to 54)	15.1	(16.1)		29	13.2	(7.8)		29	.57	.11
• Family Resource Scale (FRS)[&@]	111.7	(18.3)	39	29	114.6	(18.5)	43	27	.56	.15
• Family Support Scale (FSS)[&@]	27.3	(11.4)	47	27	30.0	(9.3)	57	27	.34	.24
• Family Index of Life Events (FILE)[@]	11.9	(6.9)	29	29	11.8	(5.9)	29	28	.98	.00

[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotients (DQs) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[†] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

Measures of Child Functioning

Comparisons between the non-parent training and the parent training groups on measures of child functioning are found in Table 14.8 for the first posttest assessment and in Table 14.9 for the second posttest assessment. Comparisons at the

Table 14.8
Posttest Measures of Child Functioning at Posttest #1

Variable	Covariates&	Center-Based			Center + Parent Training			ANCOVA F	ES^{Δ}	P Value
		$\bar{X}^{\infty}$	(SD)	n	$\bar{X}^{\infty}$	(SD)	n			
Age in months as of 5/15/87	–	49.6	(10.7)	27	46.3	(12.6)	29		-.32	.29
Battelle Developmental Inventory (BDI) DQs for: *										
Personal-Social	1, 5	59.9	(26.9)	27	65.2	(21.8)	29	1.82	.20	.18
Adaptive Behavior	2	59.4	(24.6)	27	59.3	(18.8)	29	.00	-.01	.98
Motor	2, 3	58.0	(26.4)	27	54.4	(28.2)	29	1.14	-.14	.29
Communication	1, 4, 5	57.2	(28.7)	27	54.5	(23.4)	29	.87	-.09	.36
Cognitive	2, 4, 5	58.2	(24.9)	27	60.9	(25.0)	29	.63	.11	.43
Total	6	58.0	(23.3)	27	58.5	(18.5)	29	.04	.02	.84
Child Health Rating @		2.00	(.73)	27	1.93	(.75)	29		-.10	.73
MCDI (raw)@										
General Development		76.9	(22.8)	27	77.9	(23.9)	29		.04	.88
Gross Motor		21.4	(6.5)	27	22.5	(7.1)	29		.16	.58
Fine Motor		30.0	(6.5)	27	30.3	(6.6)	29		.04	.89
Expressive Language		37.3	(10.8)	27	36.7	(11.3)	29		-.05	.85
Comprehen. Coneptual		30.4	(12.2)	27	31.3	(15.1)	29		.08	.80
Situation Conceptual		28.0	(7.2)	27	27.1	(8.8)	29		-.13	.67
Self-Help		21.0	(7.4)	27	21.9	(7.1)	29		.13	.62
Personal-Social		22.9	(5.5)	27	32.0	(6.5)	29		.03	.91

∞ Covariance adjusted means.

* For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

@ Results computed among t tests. Means are not adjusted.

& Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest.

$$^{\Delta}\ ES = \frac{\text{Parent involvement adjusted } \bar{X} - \text{Center-based adjusted } \bar{X}}{\text{Center-Based SD}}$$

Table 14.9

DDI86 - Measures of Child Functioning at Posttest #2

Variable	Covariates$^{\&}$	Center-Based			Center + Parent Training			ANCOVA F	ES$^{\Delta}$	P Value
		$\bar{X}^{\infty}$	(SD)	n	$\bar{X}^{\infty}$	(SD)	n			
Age in months as of 5/15/87$^{@}$	–	61.8	(11.6)	21	58.0	(14.4)	19		-.32	.37
Battelle Developmental Inventory (BDI) DQs for:										
Personal-Social	4	56.7	(19.0)	21	60.4	(12.0)	19	1.61	.20	.21
Adaptive Behavior	2, 3	58.4	(17.4)	21	59.9	(12.0)	19	.19	.09	.66
Motor	2, 3	58.2	(18.3)	21	60.8	(23.6)	19	.66	.14	.42
Communication	4	55.0	(25.7)	21	55.7	(19.3)	19	.03	.03	.88
Cognitive	4, 5	58.5	(21.9)	21	66.1	(20.9)	19	3.21	.35	.08
Total	6	55.7	(16.4)	21	60.4	(14.1)	19	4.12	.29	.05
Child Health Rating $^{@}$		1.85	(.59)	20	2.11	(.57)	19		.44	.18

$^{\infty}$ Covariance adjusted means.

$^{@}$ Results computed among t tests. Means are not adjusted.

$^{\&}$ Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest.

$$^{\Delta}\,ES = \frac{\text{Parent involvement adjusted } \bar{X} - \text{Center-based adjusted } \bar{X}}{\text{Center-Based SD}}$$

time of posttest show no significant differences on any measure. P-values range from .91 for the MCDI personal-social scale to .18 on the Battelle personal-social scale. No statistically significant differences were found in the health rating of the two groups.

From these results, and from the results of the DDI 85 study, it might be reasonable to conclude that parent training produces no impact whatsoever. However, measures of child functioning at second posttest suggest that some differences may appear at second posttest which do not appear at the time of the first posttest. The children whose parents experienced the parent training group had significantly higher Battelle total scores at second posttest ($\underline{p}$ = .05), and there was a trend toward significantly higher scores in the cognitive subscale (p = .08). It is possible that the results of parent training do not show up for a year, given the dynamics of working with handicapped children and the fact that parents may need time to feel comfortable with the principles they are taught. However, caution should be taken in interpreting this finding until subsequent measures are taken with this group as they move into the school system. Furthermore, replication with other similar groups would be necessary in order to truly establish this kind of lag effect.

Measures of Family Functioning

Results of the analysis of measures of family functioning at posttest time are shown in Table 14.10 while the results of the analysis at second posttest time may be found in Table 14.11. As with the child measures, no statistically significant differences between the parent training and non-parent training groups were found at posttest time. Few differences between the two groups at the time of second posttest were found. Parents who experienced parent training were less likely to feel that divine intervention was responsible for improvement in their children (p = .05). There was also a trend for parents in the parent training group to report more parent-related stress. No other significant differences were found.

Other Analyses

The only finding of significance in the area of parent satisfaction (Table 14.4) is that parent training group parents at posttest time reported feeling greater satisfaction with their opportunity to participate in their child's program (p =.04). This effect was no longer evident at the time of second posttest. At the time of second posttest, there were no significant differences between the two groups' satisfaction with services, with the exception of a trend for the comparison group to rate their ability to communicate with program staff slightly higher.

Because instructor effects have been previously noted in influencing parent involvement (Hoover-Dempsey, Bassler, & Brissie, 1987), an additional analysis was

Table 14.10
DDI86 - Family Functioning at Posttest #1

		Center-Based				Center + Parent Training				ANCOVA		P
Variable	Covariate∞	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	F	ES Δ	Value
Parent Stress Index (PSI) *#												
Child Related Range (47 to 235)	0	120.2	(23.0)	88	27	121.9	(16.1)	89	27	.13	-.07	.72
Other Related Range (54 to 270)	0	134.6	(30.2)	73	27	137.9	(21.5)	76	27	.47	-.11	.50
Total Range (101 to 505)	0	254.2	(48.9)	83	27	260.4	(35.9)	86	27	.56	-.13	.46
Family Adaptation and Cohesion Evaluation Scales (FACES)+												
Adaptability Range (0 to 24)	0	5.4	(4.3)		27	6.1	(6.8)		29	.33	-.18	.57
Cohesion Range (0 to 30)	1	7.2	(6.1)		27	7.8	(7.8)		28	.08	-.09	.78
Total Range (0 to 54)	0	12.3	(8.5)		27	14.0	(11.6)		29	.44	-.20	.51
Family Resource Scale (FRS)&#	0	112.9	(24.0)	40	27	111.5	(18.8)	39	27	.11	-.06	.74
Family Support Scale (FSS)&#	0	27.7	(10.8)	50	25	30.6	(10.0)	63	27	1.39	.27	.25
Family Index of Life Events (FILE)*	0	10.7	(7.3)	34	27	11.9	(6.8)	29	28	.82	.17	.37
Child Improvement Locus of Control@												
Professional		19.0	(3.7)		27	19.7	(3.5)		29		.18	.50
Divine Intervention		11.2	(3.8)		27	10.6	(3.3)		29		.18	.48
Parent		24.0	(3.9)		27	24.7	(2.6)		29		.17	.45
Child		21.4	(4.0)		27	20.1	(3.4)		29		-.34	.17
Chance		9.3	(3.1)		27	9.7	(1.9)		29		.13	.57
CES-D (depression)@		35.7	(12.2)		27	34.1	(12.1)		29		-.14	.61

*Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

@No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

&Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

+Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

∞Covariates: 1 = FILE; 2 = PSI Child; 3 = PSI Other; 4 = PSI-Total; 5 = FACES-Adaptation; 6 = FACES-Cohesion; 7 = FRS-Total; 8 = FSS-Total; 9 = mother's education.

$$^{\Delta}\text{ES} = \frac{\text{Parent involvement adjusted } \bar{X} - \text{Center-based adjusted } \bar{X}}{\text{Center-Based SD}}$$

Table 14.11

DDI86 - Family Functioning at Posttest #2

Variable	Covariate∞	Center-Based				Center + Parent Training				ANCOVA F	ES Δ	P Value
		$\overline{X}$	(SD)	%ile	n	$\overline{X}$	(SD)	%ile	n			
Parent Stress Index (PSI) *#												
Child Related Range (47 to 235)	0	116.4	(19.9)	85	21	116.6	(16.7)	86	19	.00	-.01	.97
Other Related Range (54 to 270)	0	128.3	(26.2)	63	21	136.9	(18.9)	75	19	3.05	-.33	.09
Total Range (101 to 505)	0	244.6	(42.9)	76	21	253.7	(33.2)	82	19	1.34	-.21	.26
Family Adaptation and Cohesion Evaluation Scales (FACES)+												
Adaptability Range (0 to 24)	0	5.9	(5.3)		21	5.8	(4.6)		19	.01	.03	.90
Cohesion Range (0 to 30)		7.7	(6.6)		21	9.2	(8.0)		19	.42	-.22	.52
Total Range (0 to 54)		13.8	(9.5)		21	14.7	(9.0)		19	.11	-.10	.74
Family Resource Scale (FRS)&#	0	116.1	(22.5)	46	21	113.3	(20.2)	40	17	.30	-.13	.59
Family Support Scale (FSS)&#	)	30.8	(9.5)	63	19	32.4	(10.5)	66	19	.29	.17	.59
Child Improvement Locus of Control $												
Professional		24.9	(5.2)		21	22.7	(4.6)		19		-.41	.18
Divine Intervention		14.2	(4.7)		21	11.4	(3.9)		19		-.60	.05
Parent		28.8	(4.8)		21	27.8	(4.3)		19		-.19	.53
Child		23.9	(4.4)		21	23.6	(4.3)		19		-.07	.81
Chance		12.2	(3.6)		21	10.8	(3.0)		19		-.37	.21

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[∞] Covariates: 0 = This same scale taken at pretest.

[Δ] $$\text{ES} = \frac{\text{Parent involvement adjusted } \overline{X} \text{ - Center-based adjusted } \overline{X}}{\text{Center-Based SD}}$$

[$] Results computed using t tests. Means are not adjusted.

completed on the posttest data which compared the effect of parenting group instructor on outcome measures for the parenting group. (Two instructors taught the parent training sessions; one had one class of 9 parents while the other had two classes which also consisted of 9 parents each.) Table 14.12 presents these results. No significant effect due to instructors was evident on child or family functioning measures.

Table 14.12
DDI86 -- Comparisons of Effect Due to Instructor at Posttest #1

	Instructor #1				Instructor #2				p Value
Variable	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	
o CES-D (depression)	29.33	5.68		9	35.44	13.73		18	.22
o PSI-Total	245.89	32.38	77	9	259.89	44.27	86	18	.41
o PSI-Child	114.67	18.90	82	9	122.61	17.07	90	18	.28
o PSI-Other	131.22	14.26	68	9	137.28	28.75	75	18	.47
o FACES-Adapt	3.89	2.37		9	5.50	6.73		18	.37
o FACES-Cohesion	6.22	9.43		9	8.22	7.16		18	.54
o FACES-Total	10.11	8.77		9	13.72	11.63		18	.42
o Battelle Total (DQ)	56.45	14.3		9	66.02	14.5		18	.12

Interviews conducted with parents at the time of the second posttest revealed that the majority were satisfied with the center-based services they received. Only one parent of the 40 interviewed reported leaving DDI because of inadequate services. Several reported problems with transportation (6 parents) or scheduling of the child's classes (3 parents). The most frequently cited service mentioned as most helpful by these parents was speech therapy.

Parents who received parent training were asked specific questions about the training. The majority (14) of these 17 parents found the center-based training more valuable than the PIE training. However, most reported less stress in their lives after the training (11) or no change in stress (2 parents). Fourteen of the 17 parents reported that they felt the parent training positively influenced their interactions with their children, with these parents claiming greater objectivity and more effective use of reward and punishment. Fifteen of the 17 parents were satisfied with the parent-training package and the information provided.

Teacher reports concerning children who had entered the public schools at the time of second posttest were obtained for 12 children, of which 6 were in the parent training group and 6 were in the comparison group. (Of the 40 children who administered the second posttest, 17 remained at DDI or in similar programs, and 1 had dropped out of school services altogether. The remaining 12 represent those who had moved into the public schools.) Because of the small sample size, no real conclusions can be drawn. It appears thus far that few differences are apparent in the two groups as reported by teachers.

The rating of the parents by the child's preschool teacher at the time of first posttest would appear to have some predictive utility, however. Because most direct interveners feel confident that they can accurately identify parents who are motivated and engage in a high quality of involvement with the child's intervention program, it was thought that this data might be useful in predicting parental success in implementing the parent program. Table 14.13 shows the correlations between the child's developmental scores at first posttest and the intervenor ratings of the parents. It can be seen that intervenor rating of parent attendance is poorly correlated with children's Battelle scores. Parent knowledge correlates significantly and positively with the child's personal-social level but does not correlate positively with other Battelle subscales. Intervenor rating of parent support is most highly related to the child's developmental scores, with parent support being significantly and positively related to the personal-social, adaptive behavior, communication, and cognitive subscales, and to the total Battelle developmental level. Thus, intervenor ratir of parent support would appear to have the greatest ability to predict child outcomes.

Table 14.13
Relationship Between Intervenor Ratings of Parents and Child's Battelle Scores at Posttest #1 (N = 51)

	Battelle Subscale					
	Personal-Social	Adaptive Behavior	Motor	Communication	Cognitive	Total
Parent Attendance	.04 p = .39	-.00 p = .50	-.16 p = .14	-.04 p = .39	-.08 p = .305	-.04 p = .39
Parent Knowledge	.29 p = .02	.08 p = .28	-.12 p = .20	.11 p = .21	.12 p = .21	.12 p = .20
Parent Support	.39 p = .00	.20 p = .08	.02 p = .44	.24 p = .05	.26 p = .03	.26 p = .03

Other analyses revealed that intervenor rating of parent knowledge (r[23] = -.06, p = .393) and parent support (r[23] = .25, p = .123) were not significantly correlated with actual parent attendance. Not surprisingly, intervenor rating of parent attendance and parent attendance at parent training sessions were significantly and positively related, r[23] = .47, p = .011. (Considering that intervenor rating included factors beyond the parent training sessions, such as attendance at IEP meetings, this is as would be expected.) Finally, parent attendance at parent training sessions was found to correlate significantly with the average time per week parents spent working with program staff (r[27] = .45, p = .009), but not with the average time per week parent spent working with the child in activities suggested by the program staff (r[27] = .21, p = .148). However, problems with these measures have been previously discussed.

Finally, the relationship between attendance at the parent training sessions and Battelle subscales is reported in Table 14.14. Parent attendance was found to relate positively and significantly with all Battelle subscales except motor and communication (where trends toward significance are noted) and with the total Battelle score. Correlations between parent attendance and second posttest Battelle scores show that the strength of this relationship actually increases for all except the communication subscales. Thus, higher parent attendance is related to higher developmental scores for the child, and this relationship generally becomes greater with time.

This finding is supported by the results of the analysis. This analysis compares parents who attended 8 or more of 15 parent sessions with the parents in the control group at the time of the second posttest. Battelle personal-social (p =.01) and total scores (p =.05) were significantly higher for the high attendance group than for the control group. No statistically significant differences were found between the groups for stress, resources, support, cohesion, or adaptability.

Table 14.14
Correlation Between Parent Training Attendance and Child's Battelle Developmental Quotient at Posttest #1 and Posttest #2

Battelle Subscale	Posttest #1 (N = 56)	Posttest #2 (N = 40)
Personal-Social	.26 p = .03	.30 p = .03
Adaptive Behavior	.25 p = .03	.27 p = .05
Motor Total	.20 p = .08	.31 p = .03
Communication	.16 p = .12	.14 p = .19
Cognitive	.26 p = .03	.31 p = .03
Total	.26 p = .03	.33 p = .02

Conclusions

The results of this study suggest that parent training might produce beneficial effects to the child in the year following parent training. Given that parent training is relatively inexpensive, the additional costs involved would appear to be money well spent if additional supporting evidence can be found in other studies. Since increased parent attendance appears to be associated with higher developmental scores for the child, efforts should be made to encourage parent attendance through incentives or other means. While this might add slightly to the costs of the parenting program, it might encourage parents to remain in the program when they might otherwise drop out.

The results of this study must be considered tentative until future replication validates them. It is also possible that the gains made by children in the parent training group could wash out over time. Findings such as these point to the importance of longitudinal study in this area.

Future Plans

No additional intervention is planned for this group, but continued efforts will be made to retain the subjects who were administered the second posttest, who will once again be tested at the beginning of summer 1989. (The Battelle and measures of family functioning will be given.) As these children progress into or through the public schools, their teachers will be contacted to provide for us reports of parent and child behavior as determined by the follow-up teacher questionnaire.

ASSOCIATION FOR CHILDREN WITH DOWN SYNDROME (ACDS)

Project #15

COMPARISON: Children with Down syndrome -- center-based program versus center-based program plus Parental Involvement (Individualized Parent Training)

LOCAL CONTACT PERSON: Fredda Stimell, Executive Director, Association for Children with Down Syndrome (ACDS)

EIRI COORDINATOR: Carol Tingey

LOCATION: Bellmore, NY (Long Island)

DATE OF REPORT: 10-8-1988

Rationale for the Study

Perhaps the most persistent of the popular issues concerning early intervention is the generally accepted statement that involving parents heavily in the intervention programs of their children results in more effective intervention services.

In both the research literature (Gatling & White, 1987) and in a recent statute (P.L. 99-457), the case for parental and family involvement has been argued. The case in the research literature has been made almost universally. White, Bush, and Casto (1987), in a review of previous reviews of early intervention efficacy, found that parent involvement was the most commonly cited concomitant variable of intervention effectiveness with 26 of 27 reviewers concluding that "more is better."

Public Law 99-457 mandates the development of an Individualized Family Service Plan (IFSP) and requires that a statement of the family's strengths and needs relating to enhancing the child's development be included as well as the major outcomes expected for the child and the family. Given the great emphasis on parent involvement by both writers in the field and legislative mandates, one might surmise that the major issues related to parental involvement have been explored and there is little need for further research. Three provocative findings suggest that this may not be so.

First, Casto and Lewis (1984), in reporting the initial results of a meta-analysis of the early intervention research, found that parents could indeed be effective intervenors, but programs that heavily involved parents did not appear to be any more effective than programs that did not. In addition, they pointed out the fact that virtually all studies that had investigated the question of parent involvement directly had been done with disadvantaged rather than handicapped children, had serious methodological flaws, used narrow and often inappropriate outcome measures, and did not verify whether parents in high involvement groups actually participated to the extent they were supposed to in the intervention program.

Second, Gatling and White (1987), in a review of 162 early intervention studies that included a substantial parent involvement component, concluded that parental involvement studies could be subdivided into two main categories. Category #1 included studies that used parents as developmental therapists for these children, while Category #2 included support provided to parents and family members. They found that 81% of the studies were limited solely or primarily to using parents as developmental therapists for their children, with support service receiving little research attention.

Third, in reviewing outcome measures used in previous intervention research, White and Casto (1985) found that family outcomes have been assessed infrequently in past research, accounting for less than 10% of outcome measures collected.

Given the above findings, it appears that research questions relating to parent involvement remains very viable. The rationale for the present study was that comparing a "rich" parental involvement program that included both parent training and parent support components and the same program with the addition of a specialized parent training component designed to increase parental skill levels in teaching their children would reveal whether the parent as teacher component would be powerful enough to show group differences as previous literature has suggested.

Overview of the Study

The Association for Children with Down Syndrome has an extensive parental involvement program. The purpose of this project was to investigate the longitudinal costs and effects of a center-based early intervention program for Down syndrome children that had extensive parent involvement, versus the same center-based program with an the additional individualized parent involvement component.

Program organization. The Association for Children with Down Syndrome (ACDS) preschool program is a privately operated program consisting of several program units directed toward children at various developmental levels. The infant program unit is for children from birth to approximately 14 months of age, while the toddler and preschool program is directed to children from 14 months of age to 5 years of age. At age 5, children are referred to their local public school district's Committee on Special Education for appropriate educational placement.

Curriculum in the program is based on a Piagetian model of development and assumes that young children with Down syndrome follow the same sequence of development as nonhandicapped children and can show gains in developmental skills. The primary goals of the program are to have each child with Down syndrome working at his/her optimal potential by identifying learning strategies and effective teaching techniques for the individual child in all developmental areas: gross motor, visual-fine motor, communication (receptive and expressive), self-help (feeding, dressing, grooming, and toileting), socialization (awareness of self, adaptation to environment, adaptive behavior, play skills) and cognitive (object permanence, generalization, and concept development).

An underlying assumption of the program is that interventions should be implemented using principles of behavioral psychology and reinforcement. Behavioral interventions are based upon the applied analysis of behavior, are habilitative, prescriptive, and emphasize positive reinforcements that can occur ecologically. The goal is to promote developmentally appropriate and socially accepted patterns of adaptive behavior.

ACDS utilizes a transdisciplinary approach to the early intervention program including a team consisting of special education teachers, assistant teachers, speech/language pathologists, social workers, psychologists, physical therapists, occupational therapists, nurse, movement and music specialist, volunteers, students and a consulting pediatrician-geneticist. The teacher acts as the team facilitator integrating the expertise of the entire team. Team meetings are held to discuss the progress of individual children as well as to develop strategies for programming. Staff also meet with parents on an individual basis.

The curriculum. The basic curriculum for the center based program utilizes a number of published early childhood education and special education curriculums such as: Karnes, M. B. (1982). *You and your small child*, Circle Pines, American Guidance Service, Inc.; Kissinger, M. E. M. (1981). *Sequenced Curriculum for the Severely and Profoundly Mentally Retarded and Multiply Handicapped*. Springfield: Chas Thomas Publisher; Hayden, A. (1981). *Down syndrome programs, University of Washington/Complication of programs*. Seattle: Child Development and Mental Retardation Center, University of Washington; Dmitrieu, V. (1982). *Time to begin*. Milton, WA: Caring, Inc. A typical day includes sensory integration, small and large group instruction (in all areas of development), individual task time, and free exploratory play activities. Throughout the day a range of therapeutic services are implemented for goals such as: eye to eye gaze, orientation to name, attending skills, as well as other adaptive behaviors. As children get older, activities are planned to emphasize independence and functional skills in order to prepare children for integration into the least restrictive environments. Data collected from children's IEPs, formalized assessments, informal behavioral observation and standardized checklists, are used for program evaluation.

Personnel

Services are provided by a multidisciplinary staff of 75 people. Each child is provided services by a transdisciplinary team that has been assigned to that child. The way in which staff is incorporated into the program is described below.

Teachers/Assistant Teachers are the primary facilitators of the team. M. S. level special educators are responsible for knowing each child's IEP that has been designed with each team member's input.

Social Workers interface with teachers to develop strategies for working with individual families and facilitate a parent-professional relationship.

Psychologists provide child assessment (formal and informal) and parental counseling and training.

Registered Nurses care for youngsters who do not feel well, and act as a resource to keep parents and staff up-to-date on health and safety issues.

Speech Pathologists provide the children at ACDS with an intensive speech and language therapy program both on an individual and group basis to minimize the severe delay in the area of language development and speech most children with Down syndrome exhibit.

Physical Therapists follow a neurodevelopmental and sensory integration approach where each child is brought through the stages of development using the prior stage's components as a building block for the next stage.

Occupational Therapists at ACDS work within the child's occupation (i.e., play), by evaluating and developing a course of therapy to enhance sensory, gross and fine motor, activities of daily living and behavioral and perceptual skills.

The Movement and Dance Specialist works with children from their earliest months at ACDS. Music, which is stimulating and expressive, motivates each child to learn and to use his/her body coordination.

Volunteers (including student and community residents) who come to ACDS from the surrounding communities are trained in specific tasks within the educational program.

Methods

Subjects

All children in the study have Down syndrome. There are 23 preschoolers in the basic parental involvement group and 26 in the expanded parental involvement group.

Recruitment. Subjects qualified for inclusion in the study if they had a diagnosis of Down syndrome. They were then matched according to their performance on the Uniform Performance Assessment (UPASS) and randomly assigned to the existing parental involvement program or to an expanded parental involvement program.

Criteria for inclusion. All children participating in the study have Down syndrome. The project serves families in Suffox and Nassau Counties, New York State. A few children from surrounding counties on Long Island are served through interagency agreement. The medical diagnosis of Down syndrome is required for enrollment in the program. Children who had Down syndrome and other complicating conditions (need of additional family support, severe developmental delay, seizures or other medical difficulties) were enrolled in the ACDS "Extended Day Classroom," and were not included in the study. All families in the program were invited to participate through written announcements and group discussion led by program staff and EIRI personnel. All families who elected to participate underwent an informed consent procedure and signed consent forms. A few families chose not to participate due to personal reasons and to involvement in other research.

Assignment to groups. Developmental level in months was measured by the child's score on the full Uniform Performance Assessment System (UPAS) that was administered by classroom teachers in the fall of 1986. Names were listed in six groupings by CA of the child. Groups were: 0-13 months; 14-20 months; 21-28 months; 29-36 months;

37-45 months; 46-58 months. In each of the groups names were listed by developmental level in months as measured by the full UPAS. The list also included information concerning sex of the child and whether the child had a heart condition. The first two names on the list were considered a pair, the third and fourth a second pair, and so on through the list. In each of the pairs the first member was assigned a group by the use of a table of random numbers. The other member of the pair was assigned to the other group.

Demographic characteristics. The basic parental involvement group and the expanded parental involvement group was then compared for sex distribution and for heart condition and found to be approximately the same. Tables 15.1 and 15.2 depict demographic characteristics and show pretest performance for each group. As may be noted, the two groups differ at pretest in only one area. The expanded intervention group reported fewer stressful life events (P = .08).

Subject Attrition. Four Spanish speaking families signed consent forms but were unable to keep appointments for assessment. Although communication with the families was facilitated with the assistance of the program's Spanish interpreter, these families were experiencing other life stressors and were having difficulties in even minor involvement in the program. Another family moved before the child received treatment. One child died suddenly of a respiratory condition during the period of the 1988 treatment. Twenty-six children and their families were treated during the 1987-88 year and will be the group used for continued treatment and for follow-up. Twenty-three children and their families constitute the comparison group.

Intervention Programs

Programs participating in both experimental groups receive the same basic center-based program, which included an extensive parental involvement program. Those children in the expanded parental involvement program receive additional

Table 15.1

Comparability of Groups on Demographic Characteristics for New York Study

	Basic Intervention			Expanded Intervention			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/88	33.3	(14.9)	23	34.1	(15.0)	26	.86
• Age of mother in years	36.3	(4.8)	20	35.9	(5.1)	23	.75
• Age of father in years	37.9	(5.1)	20	37.2	(5.6)	23	.68
• Percent Male*	52.2	--	23	53.9	--	26	.91
• Years of Education for Mother	14.5	(1.7)	22	14.1	(2.0)	23	.46
• Years of Education for Father	15.3	(1.8)	21	14.0	(2.1)	22	.03
• Percent with both parents living at home*	100	--	23	92	--	26	.18
• Percent of children who are caucasian*	100	--	22	100	--	23	1.00
• Hours per week mother employed	7.7	(11.4)	21	9.3	(14.1)	22	.68
• Hours per week father employed	42.4	(7.3)	17	41.4	(5.8)	16	.67
• Percent of mothers employed as technical managerial or above*	19.1	--	21	18.2	--	22	.94
• Percent of fathers employed as technical managerial or above*	50.0	--	20	68.4	--	19	.25
• Total household income	$41,666	(11,147)	18	$43,809	(9,670)	21	.52
• Percent of income spent on unreimbursed medical educational expenses for child	3.4	---	14	2.5	---	13	.64
• Percent receiving public assistance*	0.0	--	22	0.0	--	22	1.00
• Percent with mother as primary caregiver*	100	--	16	90.0	--	20	.20
• Percent of children in day care more than 5 hours per week*	4.8	--	21	4.6	--	22	.97
• Number of siblings	1.5	(1.1)	22	1.5	(1.2)	22	.80
• Percent with English as primary language*	100	--	16	90	--	20	.20

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Table 15.2

Comparability of Groups on Pretest Measures
for New York Study

Variable	Basic Intervention				Expanded Intervention				ANOVA F	ES$	P Value
	$\overline{X}$	(SD)	%ile	n	$\overline{X}$	(SD)	%ile	n			
• Age in months at Pretest	32.3	(14.9)		23	33.1	(15.0)		26	.03	+.05	.86
• Battelle Developmental Inventory (BDI)* DQs for:											
Personal Social	76.9	(28.0)		23	80.2	(27.9)		26	.55	+.12	.46
Adaptive Behavior	72.5	(27.3)		23	72.3	(18.9)		26	.33	-.01	.57
Gross Motor	57.6	(19.9)		23	54.1	(16.0)		26	.00	-.18	.96
Fine Motor	59.1	(21.4)		23	60.9	(17.5)		26	.67	+.08	.42
Receptive	63.8	(36.9)		23	65.2	(32.3)		26	.63	+.04	.43
Expressive	55.7	(25.1)		23	60.1	(19.6)		26	1.03	+.18	.32
Cognitive Total	63.8	(19.2)		23	65.8	(19.8)		26	.51	+.10	.48
TOTAL	67.0	(23.2)		23	67.6	(17.4)		26	.45	.03	.51
• Parenting Stress Index (PSI)											
Child Related (range 50 to 235)	102.2	(17.2)	60	23	107.6	(20.3)	71	24	.01	+.02	.94
Other Related (range 54 to 270)	119.4	(33.6)	46	23	112.3	(23.8)	35	24	.71	-.21	.40
TOTAL (range 101 to 505)	221.5	(46.9)	50	23	214.9	(42.1)	41	24	.26	-.14	.61
• Family Adaptation and Cohesion Evaluation Scales (FACES)†											
Adaptation (range 0 to 24)	7.5	(5.4)		23	5.0	(4.9)		25	2.83	+.46	.10
Cohesion (range 0 to 30)	10.2	(7.4)		23	11.9	(7.2)		25	.66	-.23	.42
TOTAL (range 0 to 54)	17.7	(8.5)		23	16.9	(8.4)		25	.11	+.09	.74
• Family Resource Scale (FRS)**	130.0	(26.6)	70	23	127.9	(22.1)	68	24	.09	-.08	.77
• Family Support Scale (FSS)**	36.8	(11.2)	77	23	32.6	(12.8)	69	25	1.47	-.38	.23
• Family Index of Events (FILE)Δ	10.0	(6.8)	40	23	6.7	(5.8)	62	25	3.19	+.49	.08

NOTES: * Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the Table indicate the distance from "ideal" in raw score units. A score of 0 is best (See Appendix A for details).

** Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies.

$ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Δ Because high raw scores are related to low percentiles, low raw scores and high percentiles are considered better.

individualized parent involvement activities. The content of both programs is described below.

Basic intervention. Both groups received the basic services of the ongoing ACDS center-based program that would have been if operation in the research were not being conducted. This program varies depending on the age of the child as described below.

Infant Classes are held at the school two times per week where parents and infants meet for individual direct service programming with the transdisciplinary team. Individualized programs are developed and implemented during two hours of direct services. At each session, parents receive written suggestions and printed educational materials for them to continue working on at home. Pertinent workshops are presented on a monthly basis, which also include rap sessions for parents. In addition, monthly home visits are made by the infant teachers. Specialists may also accompany an infant teacher on a home visit. The infant program includes children of age 2 months to 14 months. An average day includes:

9:30 - 9:45	Movement
9:45 - 11:30	Direct services, with parents, infants, transdisciplinary team members to individualize sensory stimulation programming
11:30 - 12:30	Parents from morning and afternoon classes meet for Rap with the Family Services Department. During this time the children remain in the infant classroom with the transdisciplinary team and interventions are continued. Afternoon Class - p.m. Parents come to classroom after Rap and follow same schedule as above.

The Toddler and Preschool Classes are held at the school for three hours a day five days per week. Children are transported via bus or by their parents to the school. Notebooks are used for daily communication between staff and parents. Formal parent-teacher IEP conferences are held a minimum of twice per year. Parents receive a mid-year and year-end developmental report on their child's progress. Individual and group social services to the families are available on an "as needed" basis. Home visits are made by staff members on a regular basis. An open door policy is maintained for the first few weeks of the toddler program or for any child starting school for the first time in a preschool class in order to facilitate the child's adjustment to the classroom. Parents are otherwise requested to schedule visits a minimum of once per month to see appropriate personnel and to participate in the classroom programming and learn techniques that they can carry out at home with their child. Workshops are offered to parents on topics of interest by specialists from ACDS as well as outside professionals. A typical daily schedule for a younger toddler includes:

9:30 - 10:00	Sensory stimulation/free play
10:00 - 10:45	Small group activity. Children are taken from the group for individual work on developmentally appropriate tasks and to receive therapy.
10:45 - 11:00	Large and small group activity as well as painting, shaving cream, rice, water, and other sensory play.
11:00 - 11:30	Gross motor activity. Obstacle course with tunnels chairs, ladders, etc. Also circle time to teach concepts such as in-out, on-off, and to play drums, bells, or sticks. Music to learn name, eye to eye gaze, attending skills/feeding skills.
11:30 - 12:00	Lunch time
12:00 - 12:30	Language circle, learn words and free play while getting ready for bus.

A typical daily schedule for an older toddler includes:

9:30 - 10:00	Exercise gross motor and sensory stimulation
10:00 - 10:45	Individual task and therapist time, small group/free play
10:45 - 11:00	Large and small group, arts and crafts using sensory materials
11:00 - 11:30	Gross motor course, concept circle, teaching songs and name identification.
11:30 - 12:00	Lunch/feeding
12:00 - 12:30	Free play, story, group activities
12:30 -	Dismissal

Process for selecting child's goals. Children in all units are trained on specific individual skills as determined by the following procedures.

- Behavioral observation of child by teacher/OT & PT/speech therapist/ psychologist using checklists as guideline.
- Transdisciplinary team meeting to discuss the developmental needs of the child.
- Specific target behavior selected and criteria for acquisition of behavior determined in transdisciplinary team meeting.
- Baseline behavior observed on target behavior by psychologist or trained observer in classroom using General Observation Sheet.
- If work on behavior is appropriate as seen by baseline observation it is discussed with parents.
- Teacher and/or other staff members trained to implement in classroom.

The pool of potential behaviors come from developmental assessments made by physical and occupational therapists, speech therapists, and teachers. Each of these professionals have been using assessment tools that emphasize their particular training expertise. For example, the teachers use the Uniform Performance Assessment System (UPAS). This curriculum-based criterion referenced scale divides developmental skills into: pre-academic, communication, social/self-help, gross motor categories, and includes a specific inappropriate behavior checklist. Items for the UPAS were taken from existing developmental scales.

Professionals trained in disciplines other than teaching use instruments and procedures designed to focus on child developmental status as measured by demonstrated child performance in areas of specific expertise of the discipline. For example, physical therapists assess mobility skills, and occupational therapists assess functional movement patterns. Speech, language, and communication skills are assessed by the speech therapists. Items from all of these child performance assessments have been collected onto approximately 100 pages of checklists that are kept in the child's folder and updated daily. Rather than relying on the memory of those working with the child, the exact number of occurrences of specific behaviors of each child are observed and recorded.

After data from various instruments and clinical assessment is summarized during weekly staff meetings, behaviors that the child is ready to learn are isolated and staff discusses the child's current overall functioning to select the most salient behaviors for that child. Parents give routine written and verbal input on areas of concern to them. These areas are observed and assessed by staff. When all of these measures have been integrated, the situation is discussed with parents and specific training sequences are developed that include the child's most pragmatic needs and the materials and rewards that are most effective with the child.

Although technically any of the over 100 pages of items on the transdisciplinary assessment instruments could be identified as the child's most appropriate and significant learning need, certain skills have regularly been needed by children with Down syndrome served in the program birth to five year age range.

Behavioral training programs have, therefore, been written for some 60 skills. Additional programs may be written if the process described above identifies other skills pertinent to that child's development. Each of these programs is described as a specific sequence with suggestions for rewards and criteria for completion included. Each sequence has an estimated number of minutes to complete. These training programs have been implemented by the staff in the center-based program.

Expanded intervention. Parents in the expanded parental involvement group received exactly the same services as parents in the Basic Services Group except they were also given additional services that were designed to enhance parent's abilities to tutor the child on specified skills. The expanded services were delivered as individual instruction using videotapes of interaction with a child on the skill to be trained and parent modeling to develop identified target behaviors. Those experienced in working with parents have found that although parents may learn to teach one skill effectively, and there may be general understanding of the concept, it is necessary to train parents for each new skill. The videotapes targeted compliance behaviors as well as skills in critical developmental areas.

The expanded group parents were trained individually in the use of the procedures to teach the skills needed by the child and asked to work with the child at home. Repeated contact was made by a licensed psychologist. Training included a monthly 1 hour of face-to-face individual tutorial session, and weekly follow-up telephone calls by the same psychologist. This training included the procedures to be used and incorporated parental demonstration of the training sequence with the child and criteria for attainment of the skill. Parents were also be given a written copy of the training sequence and a calendar-like chart to keep a record of home training completed. The parent used the record as a prompt to tell the psychologist during the weekly call of the training activities performed. The project social worker also contracted parents to ensure that the parents' intervention activities were proceeding smoothly.

Expanded Services group children were observed in the classroom by a "blind" observer to see if the training has generalized to the classroom setting. When a child reaches criteria on each skill, a new program was implemented on a new target skill to be trained.

Optional intervention services. In addition to the basic program, ACDS provides a variety of additional activities and services for families who choose to participate. Families in either the Basic or Expanded Services group are eligible to participate in these services. Careful records were maintained concerning which families participate in the various services available. Table 15.3 depicts attendance for both groups. Most of these services are provided through the social work/family services department. These include:

Infants - The Social Worker works with the teacher to develop strategies for working with the individual family as well as to help facilitate a parent-professional relationship. The Family Service Department plays a dynamic role in the school program lending its support to families and the transdisciplinary

Table 15.3

Attendance for Basic or Expanded Services Groups

Number of Families Participating	Control	Experimental
Back-to-School Day	16	19
Sibling Day	13	13
Father's Breakfast	9	11
Holiday Party	8	11
IEP Conference	18	23
Special Friend's Day	10	6
Average Number of Parent Participation in Classroom*	4.14	3.92

*Parents were asked to participate once a month in the classroom. There were a total of nine times (9 months) parents were asked to participate.

team through group and individual counseling, concrete services, information and referral.

Fathers - A fathers rap group is held each year in the evenings and is led by a certified social worker.

Coffee and Conversations - Group meetings held once per month for all parents to gather information, discuss concerns and bring up relevant issues.

Home Visits - The minimum number is once per year. Families with acute needs receive more home visits on an as needed basis.

STEP - Systematic Training for Effective Parenting (1976 American Guidance Service), a program designed to enhance parenting skills, is offered in a 9 week course.

Siblings - Siblings are invited on a specifically planned day to participate in a shortened school day. A series of sibling raps are offered to inform siblings about Down syndrome, enable them to meet other siblings of children with Down syndrome and provide siblings with an opportunity to express concerns and feelings.

Share - A group meeting held once per month for the parents of students graduating from ACDS. This is designed to help prepare parents to separate from ACDS, familiarize themselves with the child's needs, become advocates for their children and to understand the Committee on Special Education.

Peer Counseling - Peer counselors are parents of children with Down syndrome who have received systematic training through the Family Services Department to advise, counsel and provide support and information to new parents. Peer counselors are available to go to the hospital or the home when new babies with Down syndrome are born. Peer counseling is designed to be short-termed and self-limited.

General Support Services - The social workers serve as liaison between the transdisciplinary team and parents. They offer referrals, resources, and concrete services such as: referral to social services, public assistance, food stamps, day care, etc. as well as providing direct care information for out of state families and agencies. Conferences, relating to issues concerning children with Down syndrome and their families, are attended. A systematic information data base on all other related services and agencies has been established and maintained. This year, the services of a bilingual worker are available for hispanic families enrolled in ACDS.

Treatment Verification

A number of procedures were used in order to verify that treatment was implemented as intended. They included:

1. Collection of attendance data. The child's attendance in the regular program is recorded. The parent's attendance at training sessions is recorded. Reasons for any extended absences are recorded. Experimental group children attended an average of 170 days. Comparison group children averaged 174 days in attendance.

2. Parent Report of Tutoring at Home. Parents in the expanded services group are called weekly to report to the psychologist who has performed the individual training of the amount of training actually implemented each day and to discuss any problems occurring during tutoring.

Site review. A formal site visit was made June 1, 1988 by the site coordinator and Diane Crutcher, Executive Director of the National Down Syndrome Congress. Ms. Crutcher, in addition to her work with the Congress, holds an M.S. in Psychology and is presently a doctoral student in Special Education at Illinois State University.

The site review was conducted by Carol Tingey of USU, Diane Crutcher, Executive Director of the National Down Syndrome Congress, and Emily Lewis, Assistant to the Executive Director of the Association for Children with Down Syndrome, and Fredda Stimell, Executive Director of the Association for Children with Down Syndrome. Two parents, Helen Gilmartin and Veronica Brucato, also participated. The site review was conducted as part of the treatment verification process, which is described in the Treatment Verification Handbook for Research Sites (Frede, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews for EIRI Research Sites, which is found in Part II of the handbook.

The site review team members evaluated the program through information gained from observations of early intervention, interviews with the service delivery staff, examination of the folders, and inspection of the facility. The site review team evaluated the program in four categories: (1) services for children, (2) interactions between staff and children, (3) curriculum, and (4) administration and management. Results of the site review indicate that all criteria were fully met in all categories. Based on these findings, no further recommendations were offered.

Data Collection

Outcome data are collected for children and families in both groups in the spring of each year. Measures have been carefully selected to measure the effects of the program on both children and families in a way that allows comparison to other projects in the study as well as focusing in on some of the unique questions generated by this project.

Recruitment, training, and monitoring of diagnosticians. The assessment coordinator trained for the Fall 1986 testing left the area and a new assessment coordinator and five examiners were trained at the site by the EIRI assessment coordinator on September 2 and 3, 1987. The new coordinator is a licensed school psychologist and has experience working with children who have Down syndrome. The new assessment personnel have experience and training with assessment for handicapped children. All assessment personnel reached criteria on training materials, and pre- and posttesting for 1987 was completed without difficulty. The protocols were essentially error free.

Pretesting. After parent consent was obtained and children were assigned to groups according to their scores on the UPAS, parents were contacted and individual appointments were made with parents for the pretest battery consisting of: Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE) and the Family Adaptability and Cohesion Evaluation Scales (FACES III). The BDI was administered by a trained diagnostician who was not involved in providing other services to the family or the project and who was unaware of the child's group assignment. Testing occurred at the center where services are provided to all families. Parent report measures were completed by the parents and returned to the diagnostician coordinator.

Pretesting in the Fall of 1987 was completed during the month of September. Parents were paid $20 for participating. Since the newly trained personnel all have had considerable experience testing preschool children in other early intervention projects in the area, their experience with children and families made the testing procedure run smoothly. Data concerning the children's progress on the UPAS was collected in the regular methods and included in the information concerning pretest status of the children.

Posttesting. Posttesting occurred during the last two weeks of May and the first week of June 1988. Appointments were made by the diagnostician coordinator and assessments were completed by trained diagnosticians who do not provide other services to the family or the project and who are unaware of the child's group assignment. In addition to the pretest measures, the child's progress was measured on the Vineland Adaptive Behavior Scale (to show behavioral attainment), Real Language Assessment (to show communication competence), and the Uniform Performance Assessment System (UPAS) as an additional measure of child gain, and the parent's attitudes were measured on the Carey Temperament Scale (to show parental attitude of care responsibilities). Parent's skill in working with the child on the target behavior is recorded on video tape for analysis. A 10-point scale has been developed to code the parent and child interaction on these tapes. The degree of involvement of the parents as reported by the staff was further delineated in order to get more accurate information concerning the effectiveness of the additional parent training. Two forms were completed for each child by the child's teacher and the psychologist assigned to work with that child. In addition to progress as measured by the formal assessments, children were videotaped in the classroom on the target behaviors. These teacher/child tapes were scored similar to the parent/child tapes.

The Cattelle was not used as a complementary posttest measure in 1988, and the Receptive Expressive Emergent Language (REEL), a measure of communication competence, was selected. The Carey Infant Temperament Scale was also used as a complementary measure, since it was thought that the treatment may alter the parent's perception of the difficulty of child care. Since some of the training offered parents were to increase the social competence of children, the Vineland Adaptive Behavior Scale was given using the parents as respondents.

The UPAS, which is a report of child progress gathered by observation and adult report, was collected. This measure is regularly given to the children by the staff, and the resulting scores are used in data analysis. Although staff administrating this test may be aware of subject assignment due to their personal observation of interaction, the list of subject assignment has not been made available to staff at the center who are not directly involved with the implementation of the expanded treatment, and, therefore, largely staff who completed the UPAS were familiar with the child but not group assignment. It was also found during the pilot phase that the videotapes of parent/child interaction were difficult to score because camera placement did not allow for the face of both the parent and child to be observed. Training for the assessment personnel and more careful placement of the video camera was implemented for the posttest data collection.

Results and Discussion

The results of posttest measures of child and family functioning are presented in Table 15.4, the results of the child functioning measures indicate that there were no significant differences between the basic and expanded intervention groups on any of the measures. The expanded intervention group had higher scores on every measure but two (Battelle Motor, UPAS).

The results of posttest measures of child functioning appear as Table 15.5. From this table, it may be seen that there were significant differences between the basic and expanded intervention groups on only one measure, the adaptation scale of the FACES scales. On all other family measures, there were no differences between the two groups.

A series of further analyses were done to test for group differences. The first analysis tested whether actual attendance of parent and family members at optional family events, such as the father's breakfast and sibling nap groups, was associated

Table 15.4
Posttest Measures of Child Functioning for Alternative Intervention Groups for New York Study

Variable	& Covariates	Basic Intervention Group				Expanded Intervention Group						
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES[Δ]	P Value
• Average length of intervention in months												
• Age in months at posttest		40.6	(15.5)	--	23	41.1	(14.9)	--	26	.01	+.03	.91
• Battelle Developmental Inventory (BDI)[*]	1,2											
Personal Social		26	(11)	27	23	29	(12)	28	26	.19	+.07	.66
Adaptive Behavior		25	(8)	25	23	27	(8)	26	26	.60	+.09	.44
Gross Motor		23	(11)	24	23	22	(11)	21	26	3.14	-.26	.08
Fine Motor		25	(9)	26	23	26	(11)	25	26	.39	-.11	.54
Receptive		22	(8)	23	23	23	(6)	22	26	.72	-.14	.40
Expressive		19	(7)	20	23	20	(8)	20	26	.39	-.12	.53
Cognitive		23	(9)	24	23	24	(10)	23	26	.20	-.06	.65
BDI Total		24	(8)	25	23	25	(9)	24	26	.45	-.08	.51
Reel	1,2											
Receptive AE		21	(11)	22	22	22	(9)	21	26	.33	-.10	.57
Expressive AE		16	(11)	17	22	18	(11)	17	26	.09	+.06	.76
Combined AE		19	(10)	19	22	20	(10)	19	26	.03	-.03	.86
UPAS Age Equivalent	1,2	32	(12)	33	23	33	(14)	31	26	2.38	-.15	.13
Vineland Communication AE	1,2	20	(7)	21	23	23	(9)	22	26	.44	+.15	.51
Daily Living Skills AE		25	(9)	26	23	27	(11)	25	26	.36	-.08	.55
Socialization AE		22	(7)	22	23	24	(10)	23	26	.11	+.08	.74
Motor Skills AE		22	(9)	23	23	23	(9.)	22	26	.46	-.11	.50
Composite AE		22	(7)	23	23	24	(9)	23	26	.05	+.03	.83
Rating of Child's Health[\$]		1.90	(.62)	--	21	1.91	(.75)	--	22	.00	+.02	.98

[*] Statistics were computed using raw scores, but age equivalents have been reported for easy comparison with other tests. The means for experimental or control FILE pretest scores were used in place of missing data so computations could be made. There was one missing control and one missing experimental FILE pretest score.

[Δ] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[\$] Ratings of the child's general health were provided annually by parents and included information about visits to the doctor, hospitalizations, occurrence of fevers, and eye and ear problems. This rating is a composite of that information, which ranges from 1 (very good health) to 3 (very poor health).

[&] Covariates: 1 = Pretest FILE; 2 = Pretest Battelle Raw Score Total.

Table 15.5

Posttest Measures of Family Functioning for Alternative Intervention Groups for the New York Study

		Basic Intervention Group					Expanded Intervention Group					ANCOVA		P
Variable	Covariate[&]	X	(SD)	AdjX	%ile	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n	F	ES[Δ]	Value
Parenting Stress Index (PSI)	1,5													
Child Related Range (50 to 235)		109	(19)	108	71	23	104	(16)	104	64	23	.80	+.21	.38
Other Related Range (54 to 270)		114	(30)	112	35	23	111	(21)	112	35	23	.02	-.02	.90
TOTAL Range (104 to 505)		222	(45)	220	49	23	214	(29)	217	45	23	.27	+.07	.61
Family Adaptaton and Cohesion Evaluation Scales (FACES)[†]	2,5													
Adaptation Range (0 to 24)		8	(7)	8		23	5	(4)	5		23	3.64	+.47	.06
Cohesion Range (0 to 30)		7	(9)	8		23	8	(7)	8		23	.20	-.11	.66
TOTAL Range (0 to 54)		16	(11)	16		23	14	(10)	14		23	.50	+.19	.49
Family Resource Scale (FRS)[∞]	3,5	126	(15)	127	66	22	123	(29)	12	57	23	.34	-.28	.70
Family Support Scale (FSS)[∞]	4,5	33	(10)	32	66	22	30	(12)		63	23	.17	-.11	.68
Family Index of Life Events (FILE)[Δ]	5	8	(5)	7	62	23	8	(7)		47	24	.86	-.26	.36

NOTES: [†] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (See Appendix A for details).

[∞] Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies.

[$] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[Δ] Because high raw scores are related to low percentiles, low raw scores and high percentiles are considered better.

[&] Covariates: 1 = Pretest PSI-Total; 2 = Pretest FACES-Total; 3 = Pretest FRS; 4 = Pretest FSS; 5 = Pretest FILE.

with higher scores on child and family measures. This analysis did not reveal any significant differences between attenders and non-attenders.

Next, the amount of time handicapped children in both groups spent in day care was examined to see if a relationship existed between amount of time in day care and scores on posttest measures. There were no significant differences on this measure.

Finally, the videotaped records of parent teaching sessions were reviewed to determine if group differences existed. Preliminary findings suggest that expanded intervention group parents improved their teaching skills significantly. A scoring system has been developed to score the tapes in the two major content categories of compliance and teaching. Scoring of these tapes will be done over the next three months.

Conclusions

Analyses of the data for the two groups suggests that there are few differences between the groups on the dependent measures. It could be that the expanded intervention program was not intense enough to produce group differences. Analysis of the videotaped teaching sequences over the next three months may reveal group differences due to the fact that the videotapes capture the essence of the expanded intervention group; that is, teaching parents to be more effective teachers of their preschoolers.

Future Plans

Complementary measures to be used during posttesting 1989 will be adjusted to meet the children's expanding skill level. Several children reached a ceiling on the REEL testing in the spring of 1988. It appears that this measure will not be appropriate in the future years. The Carey Temperament Scale for older children will be used in 1989. One follow-up session in parent training and one follow-up social work contact is planned for Fall 1988.

ARKANSAS SCHOOL FOR THE DEAF

Project #16

COMPARISON: Hearing Impaired Children -- Oral/aural versus total communication (TC) training.

CONTACT PERSONS: Jerrie Sue Finch, Director, Area Services; Gillis Ward, Preschool Supervisor.

EIRI COORDINATOR: Chuck Lowitzer

LOCATION: Little Rock, Arkansas.

DATE OF REPORT: 10-8-1988

RATIONALE FOR THE STUDY

The controversy over mode of communication among educators of persons with hearing impairments has been receiving increased attention in recent years, especially as related to its impact on later language skills (Greenberg & Calderon, 1984). Little well-controlled research has been conducted that addresses this issue directly (Eiserman & White, 1987). The general purpose of this investigation was to shed light on the significance of communication mode on the overall development of preschool children with hearing impairments, focusing especially on language skills. The impact of communication mode on family functioning was also addressed. The use of random assignment to groups and other experimental controls separate this study from previous efforts.

Review of Related Research. While proponents of oral and total communication (TC) have long argued the relative benefits of these two approaches to education of children with hearing impairments (White & Stevenson, 1975), empirical evidence in support of one method over the other remains inconclusive. Grove and Rodda (1984) reviewed results of five studies that indicated that children in TC programs had better cognitive and language skills than children in oral programs, while Nix (1981) included three studies with the opposite findings in his review. These studies led Nix to question claims made by proponents of TC programs that children's auditory and verbal skills are enhanced by the use of signs, and that parents in these programs learn to sign to the extent that parent/child communication is established at desirable levels.

Research including direct comparisons of oral versus TC approaches has been conducted using matched samples rather than random samples (e.g. Greenberg, 1980; Vernon & Koh, 1970), and some studies have included only one communication mode with pre-posttest comparisons as the evaluation procedure. Very little data on early intervention per se are available. In an integrative review of research conducted by Eiserman and White (1987), only two studies of early intervention with hearing impaired children were found that addressed the oral/TC issue. In one of these studies, Greenberg (1980) found no significant differences in communicative competence among children who received oral/aural or total communication training, but did report that TC children had longer, more complex interactions with their mothers than oral children did. These differences in parent-child interaction may have implications for family functioning. Moores (1974) compared children (2-1/2 to 4-1/2 years of age) in seven preschool programs over a four year period. Four of the programs used an oral/aural approach, one used TC, and two used the Rochester method (i.e., word for word finger-spelling) at the start of the study. By the end of the study, however, only one program was using the oral/aural approach. Despite this confound, Moores concluded that early use of TC is a significant predictor of success in both communication skill and academic achievement. While the Greenberg study had fewer design flaws than Moores's study, both contained threats to their internal validity, such as inadequate descriptions of intervention strategies and questionable adequacy of the measures used.

The present study addresses the issues raised in prior studies of hearing impaired children by random assignment to groups, careful description of the children and families included, selection of assessment measures that focus on communication skills as well as cognitive and general development, and continuous monitoring of treatment implementation. For the purposes of this investigation, data are presented regarding aided and unaided hearing losses of subjects (children), their ages, length of exposure to oral and/or TC programs, pretest scores on the Battelle Developmental Inventory (BDI), a parent rating of general health, indication of other services received, and parent hearing status. Family demographic measures are also presented, including SES, number of siblings and adults in the home, and racial group. The intervention strategy is fully described, and the measures of child progress include instruments that either are normed with hearing impaired populations or have been found to effectively measure the communication skills of hearing impaired children.

Overview of Study. A three hour, two-day-per-week, center-based program for hearing impaired children was conducted at six sites of the Arkansas School for the Deaf's Preschool Network. In addition, the preschool teachers made home visits to the families using the SKI-HI program for home intervention with families of hearing impaired children.

Children and families completed assessments prior to intervention and after one and two years of intervention. The only statistically significant difference between groups was found in the adaptability domain of the Family Adaptability and Cohesion Evaluation Scales, where parents in the TC group were further from the ideal position than those in the oral group. There was a trend toward better performance by children in the TC group in both the receptive and expressive domains of the Reynell Language Development Scales, and in the Sociability Domain of the Meadow-Kendall.

Methods

Program Description

The Arkansas School for the Deaf preschool network consists of ten center based preschool sites throughout Arkansas. Teachers at six of these sites identified at least four children and their families willing to participate in the research program, and these children were enrolled in the project. The participating sites were located in Fayetteville, Forrest City, Fort Smith, Little Rock, Russellville, and Texarkana, Arkansas. Of the non-participating sites, one did not have a center based program, two did not have enough children receiving center based programs, and one had a teacher who was not interested in participating.

Features of this investigation that separate it from previous research are its use of random assignment to groups, inclusion of multiple measures of child and family functioning, a thorough description of the intervention procedures, and the systematic treatment verification measures used. These features both enhance data interpretation and replicability of the study, as well as providing the bases for further investigation by beginning to identify critical variables.

Subjects. From an initial sample of 46 children, 31 have completed first posttesting, two families having two children enrolled (see subject attrition below). The children were between the ages of 18 and 60 months of age (mean = 42.7, SD = 14.7) when they entered the center-based program and study participation began. A final sample of 26 was maintained for Year 2 posttesting after a site review indicated that group treatment differences were minimal at one site (where 6 children were enrolled).

Recruitment. Children participating in the Arkansas School for the Deaf preschool network programs qualified for participation in the research on the basis of their age and degree of hearing loss. They had an unaided hearing loss of at least 50 decibels (DB) in the better ear. An unaided hearing loss of between 50 and 90 DB was considered moderate to severe, and a loss greater than 90 DB was considered profound, for stratification purposes. Children with additional handicapping conditions were generally not eligible, although one child in the study did have mild cerebral palsy.

Parents of all children who met these criteria were contacted and given information about the research, and signed consent was obtained for approximately 90% of these children. Recruitment for this study ended in October, 1987.

Assignment to Groups. Children were randomly assigned to oral/aural or total communication after stratification by level of hearing loss (within preschool site). Assignment followed an order based on the roll of a die. For a complete description of the assignment procedures, see the 1986 Annual Report of the Early Intervention Effectiveness Institute.

Subject Attrition. To date, seven subjects (four oral, three TC) have voluntarily withdrawn from the study. Reasons given included that parents were not satisfied with their child's group placement and/or progress (two oral and two TC), and the remaining oral child dropped because she had had so much prior TC training that neither she nor her teacher could refrain from signing. Another seven subjects (2 oral, 5 TC) were dropped due to lack of attendance at the center-based program, in which cases parents were unable to provide transportation. Additionally, all six children at one site were excluded, as noted above, because of the absence of treatment differences.

Demographic Characteristics Subjects were from predominantly white, low middle class families in largely rural areas of Arkansas. Descriptive data on demographics are presented in Table 16.1. The only statistically significant difference found here was in years of father's education. The difference favored the oral group, and this difference was accounted for in posttest analyses. Differences in income, father's occupational status, percent of families receiving public assistance, mother's years of education also approached significance (.14, .18, .18, & .18, respectively). The income difference was largely accounted for by two families in the oral group reporting incomes in the $35,000-39,999 and $45,000-49,999 brackets. The average income in the oral group excluding these families was $16,083. The percent of families receiving public assistance should be related to income, and father's occupational status and mother's years of education would be expected to be related to father's years of education. Each of these variables were used as covariates in posttest analyses.

Table 16.1

Comparability of Groups on Demographic Characteristics for Arkansas School for the Deaf Program Variation Study

Variable	Oral Communication			Total Communication			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age of child in months as of 7/1/88	62.7	(16.0)	15	62.3	(14.5)	16	.93
• Age of mother in years	29.9	(4.2)	15	29.4	(3.7)	16	.76
• Age of father in years	33.1	(4.5)	14	31.4	(5.7)	16	[illegible]
• Percent male*	47.0		15	75.0		16	.11
• Years of education for mother	12.6	(2.6)	15	11.3	(2.5)	16	.17
• Years of education for father	13.2	(1.9)	14	11.4	(1.8)	16	.01
• Percent with both parents living at home	80.0		15	94.0		16	.28
• Percent of children who are caucasian*	80.0		15	93.0		16	.30
• Hours per week mother employed	17.7	(18.2)	15	19.4	(20.1)	16	.81
• Hours per week father employed	45.4	(9.7)	13	39.0	(17.6)	16	.08
• Percent of mothers employed as technical managerial or above*	20.0		15	12.5		16	.59
• Percent of fathers employed as technical managerial or above*	54.0		13	12.5		16	.02
• Total household income^	$18,233	(11,535)	15	$14,469	(7,721)	16	.30
• Percent receiving public assistance	33.0		15	44.0		16	.57
• Percent with mother as primary caregiver*	87.0		13	100.0		14	--
• Percent of children in day care more than 5 hours per week*	53.0		15	56.0		14	.88
• Number of siblings	1.1		15	.75		16	.33
• Percent with English as primary language	93.0		14	100.0		16	--

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

^Means and standard deviations for this variable were estimated from categorical data.

Intervention Programs. As indicated above, all children received half-day center based services at least two days each week, and home intervention as indicated by the SKI*HI curriculum. Children in both groups received audiological services, appropriate hearing aids were selected, and training in their proper use was provided to teachers and parents.

Oral/Aural Group. The oral/aural group was instructed using oral intervention techniques including auditory training and development of oral skills. Auditory training requires the child to respond to sound when the sound source is out of sight, as in the sample daily schedule below, and the oral procedures require the child to vocalize all communications.

Individualized Education Plans (IEPs) were written for each child at program entry, and at the end of each academic year thereafter. Audiological, speech and language, psychological, and other assessments (e.g. occupational and physical therapy) were completed and used in initial IEP development. The Texas Language Curriculum Roadmap was used during the school year as the basis for future IEP development and refinement. Audiological assessment was also conducted regularly, and comprehensive assessments, including all of the above components, were conducted every three years.

Classroom activities were designed to promote expressive and receptive language skills of all children, including word usage and concept development. Teachers administered the Ling Articulation Index to assess children's oral development and followed the Texas Language Curriculum for general programming guidelines. Objectives for IEPs were selected based on these instruments. A cognitively oriented approach to instruction that maximizes learning opportunities via structured and unstructured activities was used in the classroom. Structured activities were designed to match child interests and were presented via lesson plans that address specific objectives for each child. Using this child directed rather than teacher directed approach, activities may vary from the original plan if the children demonstrate interest in related but unanticipated areas. For example, in a travel activity that was designed to take place in a pretend car, if a child decided that his car had wings and could fly, the activity could be redirected toward air travel.

A typical schedule for a classroom day is presented below (all activities listed are in fact language activities, although only one is specifically called a "language activity):

9:00 - 9:20 AM: Group discussion of today's weather.

9:20 - 9:50 AM: Auditory training time. Children take turns listening to the teacher with their backs to her as she makes various sounds. The child listening raises her/his hand when the sound is heard.

9:50 - 10:10 AM: Free choice activity time. Children choose a play area they are interested in (e.g. kitchen, chalk board, toy box), and interact with the teacher and other children in that setting.

10:10 - 10:30 AM: Snack time. Milk and cookies are provided, and children must vocalize or sign, as appropriate, to indicate what they want. Children are also given the opportunity to practice kitchen skills, such as pouring, measuring, etc.

10:30 - 11:00 AM: Language activity. Children will play "housekeeper" today, using naturally occurring opportunities to communicate their wants, needs, plans, and actions to the teacher and to each other.

11:00 - 11:30 AM: Gross motor activity. Children will play "leap frog" and "London Bridge" to develop both their motor skills and their listening/attending skills.

11:30 - 11:50 AM: Clean-up and plan time. Children will help clean the classroom by putting toys away, etc. Plans for tomorrow's activities will be discussed, and the children's comments will be used as appropriate to modify the teacher's plan.

11:50 - 12:00 PM: Prepare to leave and departure.

Home visits. The SKI*HI curriculum (Clark, 1985) was designed for use in the homes of hearing impaired preschoolers. It provides training in hearing impairment in general, hearing aid care and maintenance, language development activities (using the same mode of communication used in the classroom), and child management. Home visits were conducted by the child's center-based teacher to ensure consistency and generalization from school to home. The home visitors monitored child development and progress as well as parent skills and needs to facilitate appropriate home programming. The equivalent of an IEP was developed for this purpose. Home visits were initially made three times a month, and tapered off as the family gained the skills and confidence to handle the daily concerns of their hearing impaired child, as well as those of the family.

Total Communication Group. The TC group was trained using a comprehensive communication program that promotes the use of oral/aural skills (by encouraging vocalization and using the same auditory training used with the oral/aural group) but allows use of Signed Exact English II (SEE II) and other gestures as needed for communication. Parents in the TC group were trained in SEE II as part of their SKI-HI program and encouraged to use sign language with their child. All other aspects of the intervention, including home visits, were the same as those described above for the comparison group. During the second year of the project, oral and TC classes were conducted by each teacher on different days of the week or at different times of day, such that treatment groups were separated at all times and the same teacher provided service to both groups. Classroom dividers were used during the first year, and although groups were kept separate in this manner, the teachers suggested that children be taught at separate times in order to improve both the quality of their instruction and their ability to teach in the appropriate mode (i.e. oral or TC).

Optional services. Optional services were available at each site, including such things as speech therapy, parent support group meetings, and other therapeutic and day care services. The extent to which parents participated in these services, as well as the type of services received, was monitored by attendance data and the parental report of additional services. These data are collected at the end of each academic year.

Treatment verification. A number of procedures were used to verify that treatment was implemented as intended. They included:

1. Collection of attendance data: The child's participation in the program is recorded according to the days of attendance at the center based program, the use of hearing aids (did the child wear his aids to the center), and the condition of the hearing aids (were the batteries working and the aids properly adjusted). Attendance at the center program has averaged 85% across the sites, with a range of 66% to 100%. Attendance by group averaged 81.9% and 84.9% for the oral and TC groups, respectively.

2. Teacher evaluations: The preschool supervisor evaluated teachers on a 3 point scale (3=criteria fully met; 2=partially met; 1=not met) that assessed the following: teacher assessment skills; IEP development skills; IEP implementation skills; presentation of instruction; and instructional environment. Average ratings by teacher were 3.0, 2.58, 2.9, 2.71, 3.0, and 2.66 (Fayetteville, Forrest City, Fort Smith, Little Rock, Russellville, and Texarkana, respectively). Additionally, teachers were ranked in quartiles (i.e. top 25%, top 50%, bottom 50%, and bottom 25%) relative to other teachers the supervisor has worked with. Two teachers were ranked in the top 25%, three in the top 50%, and one in the bottom 50%. These data suggest that the preschool teachers at ASD are performing their duties as well as or better than other teachers in comparable settings.

3. Site Review: A formal site review was conducted on April 22 & 25, 1988. The shift to alternating the times at which the groups were present for instruction had the desired impact of improving treatment differences dramatically. Specifically, teachers were less likely to use sign with the oral group when that group was in class and the TC group was not. Dr. Roberto Gonzales of the University of Northern Colorado, an independent reviewer, reported that clear communication mode differences were present (and were the only difference), with one exception. The teacher at the Texarkana site had, in Dr. Gonzales opinion, failed to implement a true TC program with

her TC group. Our review of classroom videotapes is in agreement with this finding. The teacher explains that she uses oralism heavily in this group because the children in the group respond well to oralism, and that her approach is consistent with the ASD philosophy of making maximum use of children's oral skills. For purposes of our analyses, we excluded children at Texarkana.

Otherwise, the ASD program was judged to be in full or nearly full compliance with EIRI site review quality criteria. Substantial improvement was noted in IEP development and lesson planning, with all IEP criteria being met or nearly met by all teachers. Teaching quality was found to be very good in both communication modes by the EIRI and ASD reviewers, as well as by the independent reviewer. Overall, the preschool program was considered to be of high quality as compared to other TC and oral/aural programs with similar philosophical orientations.

Cost of alternative interventions. Because the only difference between groups in this study was the mode of communication used, between group cost differences were neither expected nor found. All costs were thus averaged across all children in the study. Total cost per child averaged $3,257.10 for school services only, and $5,424.10 when the cost of parent-provided time and transportation were included. Costs of direct service (teachers, aides, supervisor, and consultants) were $2,394.42 per child, or over 70% of the school services cost and 45% of the total cost with parent transportation. Parent transportation costs included both mileage and traveling time, with time costs computed at the national average wage of $10.50 per hour. Adjustments were made for parents who car-pooled. All cost data are presented in Table 16.2.

Data Collection

Data on all participants were collected at the time of group assignment and annually thereafter. Data collection will continue in this manner until 1990.

Table 16.2

Cost Per Child for Arkansas School for the Deaf (1987-88)

Resources	Cost Per Child
Agency Costs	
Direct Service	$2,394.42
Administrative	277.96
Facilities	130.43
Equipment	69.97
Transportation:	
Staff	268.66
Parents	0
Materials/Supplies	16.88
Miscellaneous	98.78
Total Agency Cost	$3,257.10
Volunteer	
Parent Time	131.06
Parent Travel	2,035.94
Total Volunteer	$2,167.00
TOTAL	**$5,424.00**

Recruitment, training, and monitoring of diagnosticians. Three local diagnosticians and an assessment supervisor were trained by EIRI staff to administer the standard pretest and posttest measures. Professors at local universities and professionals in local social service agencies were asked if they or others they knew were willing to do testing for us. One graduate student and three professionals at a local rehabilitation program were willing to be trained in administration of the Battelle Developmental Inventory (BDI). The most experienced professional was identified as an assessment coordinator. These individuals were expected to view videotapes of administration procedures for the Battelle Developmental Inventory (BDI), review the BDI administration manual, and complete a self-test of BDI procedures before attending a two-day training session. The training session addressed all facets of the BDI, and included a competency test. Finally, persons who completed the training completed three practice tests, one of which was both shadow scored and videotaped by the coordinator. The videotape was sent to EIRI for review, and an interrater agreement of .80 was required before certification as a diagnostician.

The supervisor and two of the diagnosticians hold Ph.D.s and the other has a master's degree. Student diagnosticians who administer the complementary measures are selected by the faculty of the Department of Speech and Language Pathology at the University of Central Arkansas (UCA) based on completion of a specified set of courses in speech pathology. All diagnosticians are proficient in sign language. Testing is scheduled by the local coordinator in cooperation with the assessment supervisor, who shadow scores 10% of the test administrations. Shadow scored tests for 1988 indicate an average of 93.3% agreement, with a range of 91 to 96%. Agreement was calculated by dividing the number of exact agreements in scoring items administered by the total number of items administered. Exact agreement means that both raters scored an item '0,' '1,' or '2.'

Pretest. The pretest battery consisting of the Battelle Developmental Inventory (BDI), the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES) was administered to 31 children and families. Scheduling problems resulted in a number of tests not being administered until late December, 1986. Families were given a $20 incentive for their participation in pretesting. Testing was conducted by one of the diagnosticians, each of whom is a fluent signer and unaware of the child's group assignment. Mode of administration for the BDI (i.e., oral vs.TC) was determined by the examiner after a period of interaction with the child and family, and was noted on the test protocol. Testing occurred in rooms provided at the preschool site where the child attends class. Mothers completed the family measures following administration of the BDI, and fathers (when possible) completed the Family Support Scale only. If the father or other male was present in the home but was not at the testing session, the parent was given a copy of the Family Support Scale to take home for him/her to complete. The diagnosticians completed testing reports and transmitted all data to the assessment supervisor, who checked the scoring accuracy and forwarded the protocols to EIRI via certified mail.

Posttest #1: The first round of posttesting occurred during April and May, 1987 for children enrolled during the 1986-87 academic year, and in April and May, 1988 for those who were not enrolled until the 1987-88 academic year, allowing five to six months of intervention between pre- and posttesting. The posttest battery is administered in two sessions, as described below.

The first session was conducted by graduate practicum students from the department of speech pathology at the University of Central Arkansas (UCA). Tests administered at this time were the Receptive and Expressive Language sections of the Reynell Developmental Language Scales. A language sample was collected and the Hodson Phonological Inventory was also administered at this time. Each of these measures was administered by the same student to all children. That is, one student did all the Reynell Receptives, another all the Reynell Expressives, etc.. Because of the nature of these tests and the experimental comparison (oral vs. TC), these diagnosticians knew the mode of communication used by the child, but were unaware of the purpose of the study. Tests were administered in the mode appropriate to the child's group. The graduate students are supervised by faculty from UCA.

The second session was administered by the same set of naive diagnosticians, but not necessarily the same diagnostician, who administered the pretests. In addition to the instruments used at pretest, mothers completed the Parent Survey Form, the Parent Report of Child's Health, the Additional Services Form, and the Parent Satisfaction with Services Form, and teachers completed the Meadow-Kendall on each child in their classroom. Parents were paid a $30 incentive for testing.

Posttest #2. The second round of posttest data collection was conducted from April through June, 1988, with a total of 22 children and families participating. Four additional children were recruited for the second year and will complete second posttests in 1989. The procedures used and measures included were the same as those employed in the first posttest session, except that parents were asked to complete one additional measure. This last measure was completed by both parents, and focused on their perceptions of the impact of a hearing impaired child on the family, maternal and paternal roles with hearing impaired children, and familiarity with and understanding of deafness. The instrument used was adapted from McNeil and Chabassol (1984) study of paternal involvement in programs for children with hearing impairments. Posttest measures were selected based on expected program impact and on a survey of teachers' goals for children and families.

Results and Discussion

Comparability of groups on pretest measures. Pretest data from child and parent measures appear in Table 16.3. No statistically significant differences were in any pretest measures, although there is a trend for children in the oral group to function high on the BDI. BDI data was included as covariate in posttest analyses.

Child hearing loss data are presented in Table 16.4, which indicate that the groups were comparable in unaided loss in both ears. Aided data remain incomplete, due to the difficulties associated with testing young children with their aids on.

With respect to parent measures, differences on the "other related" stress domain of the PSI approached statistical significance ($p < .10$). The effect size in this domain is nearly 2/3 of a standard deviation ($ES = .63$), suggesting that there may also be practical differences, with the oral/aural group exhibiting higher levels of stress. This difference was accounted for in posttest analyses.

Measures of child functioning: An ANCOVA procedure was used to analyze posttest BDI data, with posttest raw scores as the dependent variables, oral or TC group as

Table 16.3

Comparability of Groups on Pretest Measures
for Arkansas School for the Deaf Pretest

	Oral Communication				Total Communication						
Variable	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ESs	P Value
• Age in months at Pretest											
• Battelle Developmental Inventory (BDI)*											
DQs for:											
Personal Social	89.3	(33.1)		15	87.3	(26.8)		16	.01	.02	.92
Adaptive Behavior	88.6	(20.0)		15	84.3	(18.0)		16	.20	.15	.66
Motor	90.2	(16.6)		15	83.7	(17.1)		16	.13	-.13	.73
Communication	46.8	(25.9)		15	36.2	(21.2)		16	.50	-.25	.49
Cognitive	70.8	(24.8)		15	70.3	(19.1)		16	.00	-.01	.98
TOTAL	77.0	(17.3)		15	73.2	(15.4)		16	.07	-.10	.79
• Parenting Stress Index (PSI) Percentile Rank +											
Child Related (range 50 to 235)	111.4	(11.9)	76	15	111.3	(23.2)	76	16	.00	.00	.99
Other Related (range 74 to 200)	138.9	(28.1)	77	15	122.8	(19.5)	55	16	3.45	-.63	.07
TOTAL (range 137 to 328)	250.4	(30.3)	80	15	234.0	(40.1)	66	16	1.55	-.44	.22
• Family Adaptation and Cohesion Evaluation Scales (FACES) Δ											
Adaptation (range 0 to 24)	9.1	(8.1)		15	9.4	(9.6)		16	.01	.03	.91
Cohesion (range 0 to 30)	8.7	(8.6)		15	8.3	(7.3)		16	.02	-.05	.90
TOTAL (range 1 to 54)	17.7	(11.3)		15	17.8	(11.2)		16	.00	.01	1.00
• Family Resource Scale (FRS)&	121.4	(22.3)	55	15	122.9	(18.1)	60	16	.04	.07	.83
• Family Index of Life Events (FILE) +	26.1	(11.1)	98	15	26.8	(7.9)	98	16	.04	.07	.85
• Family Support Scale (FSS)&	11.1	(5.9)	4	15	8.3	(5.5)	2	16	1.92	-.49	.18

NOTES: * Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

Δ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scor reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A f uls).

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

@ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

+ Percentile for the PSI and FILE are taken from normative data.

Table 16.4
Comparability of Groups on Hearing Characteristics for Arkansas School for the Deaf: Posttest 1 and 2 Hearing Impairment Measures

Variable	Oral Communication			Total Communication			ANOVA		P
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n	F	ES*	Value
First Posttest Subjects									
o DB loss left ear	86.5	(17.7)	15	89.1	(16.8)	16	.18	.15	.67
o DB loss right ear	85.2	(15.7)	15	85.8	(20.4)	15	.01	.03	.92
o DB loss better ear	80.7	(16.6)	15	82.8	(19.3)	16	.11	.12	.74
o Age in months when aided	22.3	(14.4)	15	23.4	(9.4)	16	.07	.09	.80
o DB loss w/hearing aid	37.2	(13.7)	14	48.6	(17.4)	13	3.61	.73	.07
o Months of prior preschool	10.6	(11.1)	15	7.9	(7.2)	16	.66	-.29	.42

*Effect size computed by subtracting oral mean from TC mean and dividing by the pooled SD. Positive effect sizes in hearing loss data indicate larger losses in the TC group.

independent, and pretest total BDI DQ as the covariate. Covariates were determined by a series of correlation and regression analyses. Although significant differences in father's education were found at pretest, mother's education correlated more highly with child DQ than did father's ($r = .47$, $p < .01$, vs. $r = .31$, $p < .05$). Income was also found to correlate with the personal/social, adaptive behavior, and motor domains ($r = .31$ to $.39$, $p < .05$). A stepwise regression procedure indicated that BDI total DQ, mother's education, and income were significant predictors of posttest DQs, and thus these variables were included as covariates in the ANCOVA.

As can be seen in Tables 16.5 and 16.6, there were no statistically significant differences between the groups on any posttest measure at either first or second posttest. The difference in the social domain of the Meadow-Kendall at second posttest approaches significance ($F = 3.31$, $p < .10$), however, with the TC group

Table 16.5

Posttest Measures of Child Functioning for Alternative Intervention Groups for Arkansas: First Posttest

Variable	Covariates[&]	Oral Communication Group				Total Communication Group				ANCOVA F	ES[@]	P Value
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n			
Average length of intervention in months	–	16.2			15	16.9	(4.3)		16		.24	.58
Age in months at posttest	–	49 6	(15.3)		15	49.6	(13.9)		16	.00	.00	1.00
Battelle Developmental Inventory (BDI)[*]	1, 2, 3											
Personal-Social		77.1	(27.4)	75.8	15	70.6	(20.0)	71.9	16	.04	-.06	.84
Adaptive Behavior		80.3	(21.2)	77.4	15	77.3	(17.4)	80.2	16	.07	.06	.80
Motor		83.4	(15.1)	80.3	15	84.8	(15.8)	87.9	16	.23	.10	.63
Communication		47.1	(16.5)	44.9	15	42.8	(17.2)	45.0	16	.00	-.02	.98
Cognitive		62.6	(18.7)	60.6	15	63.1	(17.3)	65.1	16	.09	.03	.76
Total		70.0	(16.3)	67.9	15	67.1	(13.5)	69.2	16	.02	-.00	.90
Reynell Raw Score[†]	4, 5											
Receptive		27.6	(13.1)	27.1	12	26.9	(13.2)	27.4	16	.00	.00	.96
Expressive		19.5	(15.4)	18.7	12	17.1	(11.5)	17.9	16	.03	-.06	.87
Meadow-Kendall Scale Score[Δ] Item Average	6, 7											
Social		3.46	(.55)	3.45	14	3.36	(.42)	3.37	16	.25	-.16	.63
Cognitive		3.50	(.45)	3.50	14	3.26	(.60)	3.26	16	1.56	-.44	.22

NOTES: [*] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Effect Size (ES) is defined here as the difference between the groups (TC minus Oral) on the ANCOVA adjusted scores, divided by the unadjusted pooled standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[&] Covariates: 1 = BTR (total Battelle raw score); 2 = mother's education; 3 = father's education; 4 = BDI receptive; 5 = BDI expressive; 6 = BDI personal-social; 7 = BDI cognitive

[†] Reynell raw score represents the average score in each group based on a possible total of 67 for both receptive and expressive speech.

[Δ] Meadow-Kendall scale score is determined by dividing the total raw score for the scale by the number of items in the scale. The scale score represents the average score for each scale based on a minimum of 1 and a maximum of 4. Higher scores indicate a prevalence of the trait or behavior measures.

Table 16.6

Posttest Measures of Child Functioning for Alternative Intervention Groups for Arkansas: Second Posttest

Variable	Covariates[&]	Oral Communication Group				Total Communication Group				ANCOVA F	ES[@]	P Value
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n			
Average length of intervention in months	–	28.8	(.75)		10	27.9	(3.6)		12		-1.29	.36
Age in months at posttest	–	[illegible]	(10.9)		10	63.6	(12.3)		12		-.10	.81
Battelle Developmental Inventory (BDI) *	1, 2, 3											
Personal-Social		74.8	(22.3)	71.9	10	77.2	(21.1)	80.0	12	.36	.26	.56
Adaptive Behavior		83.6	(18.7)	79.8	10	75.3	(19.1)	79.1	12	.31	-.22	.58
Motor		85.6	(14.7)	81.0	10	82.9	(23.1)	87.7	12	.29	.17	.59
Communication		46.4	(15.9)	42.1	10	37.6	(12.9)	41.9	12	.12	-.11	.74
Cognitive		68.9	(23.3)	67.2	10	63.6	(18.6)	65.3	12	.43	-.14	.52
Total		70.5	(16.2)	67.4	10	66.2	(16.5)	69.4	12	.04	.06	.85
Reynell Raw Score †	4, 5											
Receptive		33.4	(12.9)	30.2	10	32.8	(15.7)	35.9	12	1.08	.40	.32
Expressive		36.7	(16.8)	32.8	10	33.4	(13.9)	37.3	12	.72	.29	.41
Meadow-Kendall Scale Score Δ	6, 7											
Sociable		3.22	(61.1)	3.25	9	3.45	(26.4)	3.42	12	.60	.37	.45
Developmental Lags		3.60	(26.9)	3.63	9	3.57	(34.1)	3.55	12	.24	-.26	.63

NOTES: * Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Effect Size (ES) is defined here as the difference between the groups (TC minus Oral) on the ANCOVA adjusted scores, divided by the unadjusted pooled standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[&] Covariates: 1 = BTR (total Battelle raw score); 2 = mother's education; 3 = father's education; 4 = BDI receptive; 5 = BDI expressive; 6 = BDI personal-social; 7 = BDI cognitive

† Reynell raw score represents the average score in each group based on a possible total of 67 for both receptive and expressive speech.

Δ Meadow-Kendall scale score is determined by dividing the total raw score for the scale by the number of items in the scale. The scale score represents the average score for each scale based on a minimum of 1 and a maximum of 4. Higher scores indicate a prevalence of the trait or behavior measures.

performing better than the oral group. Items in this measure are rated on a scale from 1 to 4, with 4 indicating that a child routinely uses a given skill, performs a certain adaptive behavior, or does not perform a given maladaptive behavior, and 1 indicating the opposite. Thus higher scores represent higher functioning levels, and scores reported in Table 16.6 represent averages across items in each domain.

Measures of family functioning. First posttest results from family measures are presented in Table 16.7, and second posttest results appear in Table 16.8. The only statistically significant difference at first posttest is found on the FACES adaptability domain, where the TC group is further from ideal than the oral group, and the difference in that same domain approaches significance at second posttest. The distance from ideal (center) in the cohesion and adaptability domains was computed by taking the median point reported by Olson and McCubbin (1983) along these domains and subtracting the score received by each family, using the absolute value for negative results. The fact that the TC group has moved progressively further from center at each test suggests that families in this group are becoming more like the standardization group used by Olson and McCubbin, in that these developers of the instrument reported that families of young children tended to function in the extreme ranges on both adaptability and cohesion. Additionally, there is a small but corresponding decline in child related stress reported by parents in the TC group. This is also in keeping with the findings of Olson and McCubbin, who suggested that families adjust their functioning strategies in such a way as to reduce their stress levels. That pattern is not evident in the oral group.

Subgroup Analyses

The study sample was broken into subgroups by level of hearing loss, and age when the child first used hearing aids. Data from the first posttest were then analyzed with two-way ANOVAs. Neither of these analyses indicated significant interactions of main effects.

Table 16.7
Posttest Measures of Family Functioning for Alternative Intervention Groups, Arkansas: First Posttest

Variable	Covariate[∞]	Oral Communication Group					Total Communication Group					ANCOVA		
		$\bar{X}$	(SD)	AdjX	%ile	n	$\bar{X}$	(SD)	Adj$\bar{X}$	%ile	n	F	ES[Δ]	P Value
Parent Stress Index (PSI) [*]														
Child Related	1, 2	112.7	(13.4)	112.1	79	14	111.2	(15.5)	111.9	76	16	.002	.02	.96
Other Related	2, 3	125.9	(20.9)	123.2	60	14	123.8	(17.9)	126.5	56	16	.24	.17	.63
Total	2, 9	238.7	(32.5)	233.9	69	14	235.1	(28.1)	239.8	67	16	.33	.19	.57
Family Adaptation and Cohesion Evaluation Scales (FACES)[+]														
Adaptation Range (0 to 24)	4	4.8	(5.7)	4.7		15	11.5	(7.1)	11.6		16	10.5	.95	.00
Cohesion Range (0 to 30)	5	9.3	(6.4)	9.3		15	8.3	(8.7)	8.2		16	.18	-.15	.67
Total Range (0 to 54)	4, 6	14.0	(8.5)	14.1		14	19.8	(11.3)	19.8		15	2.5	.55	.13
Family Resource Scale (FRS)[$#]	7	112.6	(26.3)	112.6	40	15	122.6	(10.2)	122.6	60	16	1.9	.50	.18
Family Support Scale (FSS)[$#]	8, 10	31.5	(10.7)	30.9	63	15	28.4	(7.9)	28.9	50	16	.45	-.21	.51
Family Index of Life Events (FILE)[*]	2, 9	9.7	(5.6)	8.7	47	15	8.0	(6.7)	8.9	47	16	.03	.03	.86

[@] Effect Size (ES) is defined here as the difference between the groups (TC minus Oral) on the ANCOVA adjusted scores, divided by the unadjusted pooled standard deviation (see Glass, 1976; Tallmadge 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[+] Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the TC group performed closer to "ideal."

[$] Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with handicapped children).

[∞] Covariates: 1 = PSI Child; 2 = FILEA; 3 = PSI Other; 4 = FACES-Adaptation; 5 = FACES-Cohesion; 6 = FACES-Total; 7 = FRS-Total; 8 = mother's education; 9 = PSI-Total; 10 = FSS-Total.

Table 16.8

Posttest Measures of Family Functioning for Alternative Intervention Groups, Arkansas: Second Posttest

Variable	Covariate[∞]	Oral Communication Group					Total Communication Group					ANCOVA F	ES$^{\Delta}$	P Value
		$\overline{X}$	(SD)	AdjX	%ile	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n			
Parent Stress Index (PSI)[*]														
Child Related	1, 2	110.6	(8.9)	109.9	76	8	112.7	(10.2)	113.4	79	10	.72	.36	.41
Other Related		129.3	(25.6)	128.6	65	8	127.9	(25.2)	128.5	63	10	.00	.00	.99
Total		239.8	(31.0)	238.6	71	8	240.6	(33.5)	241.8	72	10	.06	.10	.82
Family Adaptation and Cohesion Evaluation Scales (FACES)[+]														
Adaptation Range (0 to 24)	6	8.2	(5.7)	7.8		11	15.9	(6.8)	16.3		11	11.2	1.10	.00
Cohesion Range (0 to 30)	7	7.3	(6.4)	7.5		11	7.5	(5.8)	7.3		11	.01	-.03	.93
Total Range (0 to 54)	6	15.6	(8.9)	15.1		11	23.4	(10.1)	23.9		11	4.8	.87	.03
Family Resource Scale (FRS)[$#]	3	119.2	(19.0)	117.6	51	10	119.0	(14.6)	120.5	51	11	.17	.17	.69
Family Support Scale (FSS)[$#]	4, 5	26.9	(14.5)	20.9	47	10	20.4	(9.5)	26.4	27	11	1.60	-.45	.22
Family Index of Life Events (FILE)	1, 2	6.8	(6.9)	6.8	37	11	7.3	(5.1)	7.3	37	12	.07	.08	.79
Percent of income spent on reimbursed medical/ educational expenses for child	---	8.41				10	2.48				0			.17

[@] Effect Size (ES) is defined here as the difference between the groups (TC minus Oral) on the ANCOVA adjusted scores, divided by the unadjusted pooled standard deviation (see Glass, 1976; Tallmadge 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[+] Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details) and positive ESs indicate that the TC group performed closer to "ideal."

[$] Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with handicapped children).

[∞] Covariates: 1 = PSI-Total; 2 = FILE; 3 = FRS-Total; 4 = FSS-Total; 5 = mother's education; 6 = FACES-Adaptation; 7 = FACES-Cohesion.

That no differences in child performance were found along the levels of hearing loss was somewhat surprising, in that one would expect children with better hearing to perform better at least in areas of communication. However, with pretest performance as a covariate, there are no statistically significant differences at posttest.

Conclusions

The absence of statistically significant treatment group differences in the child measures over the first two years of the project suggests that mode of communication makes little difference in the short term development of hearing impaired children. These children thus appear to enter school programs with comparable skills. The differences found based on income level suggest that there may be some difference in child performance based on family demographics. The absence of differences in most areas of family functioning make this income factor difficult to interpret. One might expect that differences in family functioning as measured by the FACES would influence other areas as well, but no other differences were found. One can only speculate that the combination of income and other sources of social support may provide an atmosphere more conducive to child progress.

The fact that even level of hearing loss fails to yield significant differences in child performance may be viewed as an indication that intervention is equally effective with children with profound losses and those with less severe losses. If children in both groups continue to progress in communication skills and other areas, such a finding will be supportive of the value of early intervention with hearing impaired children regardless of mode of communication.

Future Plans

Intervention will continue as it had been prior to the start of this investigation, and the mode of communication used will depend on the needs of children in the center-based program. However, if the number of children available for oral and

TC programs does not justify separation of the groups, all training will occur in a combined group setting. That is, if there is a need for both oral and TC programs at individual sites, children will continue to receive service in the mode appropriate for study participation. If there are not enough children to justify running a separate TC program, for example, all children at that site will be taught TC with the oral group.

During each quarter of the year, letters will be sent to families in order to ascertain that we have current addresses. For children no longer of preschool age, the name and address of the school they are attending and the names of their teachers will be requested from the parent. The letter will also ask permission to contact the teacher for information about the child's school program. Teachers will then be contacted regarding the type of program the child is in (i.e., residential, public, or private school), mode of communication used, classroom makeup (i.e. number and type of students), and issues related to child performance. At the end of the academic year, teachers will be asked to complete the Meadow-Kendall as part of posttest procedures. We will also continue to request information about the nature and level of each child's hearing loss, as audiograms may provide more accurate data as children age.

Finally, we plan to ask both parents at this site to complete the FACES III at the next posttest to determine how consistent their perceptions of family functioning are. We believe this will provide a more complete picture of the functioning style of these families, and serve as a pilot test for use of this procedure at other sites.

UTAH PARENT INVOLVEMENT STUDY (1985)
Project #17

Comparison: Moderately to Severely Handicapped Children--Center-based intervention plus parent training versus center-based intervention only.

Local Contact Person: Leon Soderquist, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Marcia Summers

Location: Salt Lake City, Utah

Date of Report: 10-8-1988

Rationale for Study

Many early intervention professionals claim that parent involvement in early intervention produces better results for children than no parental involvement (Bronfenbrenner, 1974; Garland, Swanson, Stone, & Woodruff, 1981; Johnson & Chamberlin, 1983; Karnes & Lee, 1978; Lazar, 1981; Parker & Mitchell, 1980; Simeonsson, Cooper, & Scheiner, 1982). In an examination of reviews of early intervention literature, the most frequently cited concomitant variable was parental involvement. Twenty-six of 27 reviewers concluded that parental involvement is associated with increased benefits for children (see White, Bush, & Casto, 1985, 1986).

Although the claim that parent involvement is beneficial for children is widely accepted, there is little empirical evidence to support this view. Relatively few studies have used the experimental method to test the notion that parental involvement is more effective than no parent involvement. Even fewer studies have used random assignment of subjects to differing treatment conditions. Lack of random assignment in early intervention research is largely due to the ethical concerns of offering treatment in a random manner. White and Pezzino (1986) have addressed the validity of such concerns and concluded that the infrequent use of randomization has been a serious impediment to the advancement of knowledge about the efficacy of early intervention. They argue that such designs are feasible to implement and, if properly conducted, are neither unethical nor illegal. A methodologically well-designed study which includes random assignment of subjects is, in fact, necessary in order to determine the effectiveness of parent training.

This study is very similar to the Utah Parent Involvement 1986 study; it is also very similar to the Des Moines study. This study differs from the Des Moines study in that the children in this study are younger than those at Des Moines and DDI is a private non-profit agency while the Des Moines study is being conducted at a public school. This study is identical to the Utah Parent Involvement 1986 study in its methodology, although slight differences in the instruments used in assessment may be found. (For example, a measure of home environment called the HOME is used in the Utah Parent Involvement 1985 study, but not in the Utah Parent Involvement 1986 study.) For the most part, however, the Des Moines and Utah Parent Involvement 1985 and 1986 studies are the same procedures and methods of assessment. These three studies provide a systematic and concurrent replication of each other. The literature on parent involvement has been severely criticized for the lack of replication and limited generalizability of its studies (Clarke-Stewart, 1982). The use of a second cohort of children at Developmental Disabilities Incorporated also helps to control for one threat to internal validity (history).

Review of Related Research

Table 17.1 shows the results of an integrative review of 22 studies that compared levels of parent involvement or presence/absence of parent involvement. "Conceptual clarity" indicates the degree to which extraneous factors other than the comparison of parent involvement are controlled. Studies that compared parent involvement in addition to intensity and age-at-start, for example, would be considered as "poor" since it is not clear which (parent involvement, intensity, or age) accounted for the differences. "Methodological quality" refers to the assessed

Table 17.1

Direct Comparisons of the Effects of Parent Involvement

	Conceptual Clarity of Experimental Contrast	Number of Studies	Methodological Quality of Studies	Average Effect Size	References
Studies with Handicapped Children	Good	3	1 fair 2 poor	.86	Henry, 1977 Minor et al., 1983 Scherzer, 1976
	Moderate	1	1 poor	.51	Goodman et al., 1984
	Poor	4	1 good 1 fair 2 poor	-.05	Bidder et al., 1975 Horton, 1976 Hudson, 1982 Kysela et al., 1981
Studies with Disadvantaged Chidlren	Good	7	1 fair 6 poor	.21	Duseqicz & O'Connell, 1975 Gilmer, 1969 Karnes et al., 1970 McCarthy, 1968 Nelder & Sebra, 1971 Radin, 1971 Ster[illegible] Marshall, & Edwards, 1969
	Poor	6	1 good 1 fair 4 poor	-.06	Duseqicz & O'Connell, 1975 Miller & Dyer, 1975 Nelder & Sebra, 1971 Ramey & Bryant, 1983 Scott, 1974 Slaughter, 1983
Studies with At-Risk Children	Poor	1	1 fair	.88	Williams & Scarr, 1971

threat to internal and external validity. (For further information concerning the manner in which these studies were rated, see the final report of the Early Intervention Research Institute, 1987.)

It can be seen that very few studies were conceptually or methodologically sound. No studies were rated "good" in both areas. Given the weaknesses of the studies, the efficacy of parent involvement cannot be considered to be conclusive. Also, none of the studies report data from follow-up testing, and retention of parent involvement or training is not known. Since studies involving disadvantaged children have cautiously suggested that some benefits due to parent training may be long-lasting (Haskins & Adams, 1982), the importance of longitudinal research in this area becomes obvious.

Thus, the goal of this research was to determine the immediate and delayed impact of adding a structured parent training program to an existing center-based early intervention program that provided minimal parent involvement.

Overview of Study

Fifty-one moderately and severely handicapped children were randomly assigned to a center-based early intervention program plus parent training or a center-based intervention alone. The goal of this research was to determine the impact of adding a structured parent training and involvement program to an existing center-based early intervention program.

Treatment locations included Developmental Disabilities, Incorporated and the Jordan Valley Child Development Center. Both centers are located in the greater Salt Lake City area. Mean age of the children at the beginning of the intervention was 48.7 months. Training was provided to parents one time per week (90 minutes) for 15 weeks. Parents were asked to complete home assignments following training sessions and to report the length of these sessions. An extensive battery of measures were used at the time of pretest and first and second posttests. Measures included the

Battelle Developmental Inventory, Parenting Stress Index, Family Adaptability and Cohesion Evaluation Scale, Family Resource Scale, Family Support Scale, and a variety of teacher and parent surveys. Results were determined through use of analysis of variance and analysis of covariance. Covariates were respective pretests and mother education.

Subjects

Fifty-one moderately and severely handicapped children were included in the study. Thirty-one subjects were classified as developmentally delayed. Other handicapping conditions included orthopedically impaired (8 subjects), sensory impairment (2 subjects), Down's Syndrome (9 subjects) and behaviorally impaired (1 subject). The two locations for the study included Developmental Disabilities, Incorporated, and the Jordan Valley Child Development Center. Both centers are located in the greater Salt Lake City, Utah area.

Recruitment. Subject recruitment for this cohort was completed in November 1985. Children, and their families, who were participating in classes taught through DDI or Jordan Valley's services for handicapped preschoolers were considered for inclusion in this study. Fifty-one students were thus recruited to participate in the study. Selection into the study was based on parents' willingness to participate without prior knowledge of treatment group assignment.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups. Prior to the initiation of treatment, parents were either assigned to a group in which they received additional training or to a group in which parents received no additional training. The group not receiving additional parent training continued to receive the same level of training that was previously available through DDI's program for handicapped preschoolers.

In order to ensure the comparability of groups, subjects were assigned to groups randomly after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six possible mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their DQ test scores obtained from a number of assessment instruments previously administered as part of the eligibility process for receiving services at DDI.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination for the subject with the lowest DQ score, in each age X motivation cell was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups.

Demographic Characteristics. Table 17.2 shows the comparison of the parent involvement and center-based only groups at the time of pretest. The SICD is the Sequenced Inventory of Communication Development, a language measure. The Minnesota Child Development Inventory is a parent-scored measure of the child's developmental level. No significant differences were found between the groups on these measures; nor were significant differences found on the Battelle total raw scores, the Stanford Binet IQ measures, or the Bayley Infant Development Scales.

Few significant differences between the groups can be found in terms of demographic characteristics. Children in the comparison group had a significantly higher number of siblings, and their mothers had a significantly higher level of education than did mothers in the parent training group. Number of siblings was found to be unrelated to measures of child and family functioning, but maternal education correlated significantly with a number of the measures. Thus, this variable was used as a covariate in all subsequent analyses.

Table 17.2

Demographic Characteristics at the Time of Pretest

Variable	Center-Based			Center-Based & Parent Training			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age in months	46.2	(9.8)	26	47.0	(8.2)	25	.77
• Percent male*	70.0		26	56.0		25	.34
• Mother education	12.7	(1.8)	26	14.1	(2.0)	25	.02
• Father education	14.5	(1.9)	26	14.6	(2.2)	25	.83
• Family income Δ	26,615	(10,782)	26	26,125	(10,670)	25	.90
• Mother age	31.6	(4.7)	26	33.6	(5.9)	25	.19
• Father age	33.5	(5.0)	26	34.4	(6.9)	25	.62
• Percent White - Mother*	85.0		26	88.0		25	.73
• Percent White - Father*	92.0		26	88.0		25	.62
• Number of siblings	1.9	(.97)	26	2.6	(1.4)	25	.02
• Percent of fathers employed as technical/ managerial or above*	60.0		26	79.0		24	.15
• Percent of mothers employed as technical/ managerial or above*	12.0		26	12.0		25	.96
• BDI total raw	301.9	(86.0)	26	303.7	(79.9)	25	.94
• SICD (age equivalent) Receptive	27.4	(8.6)	26	26.5	(9.5)	24	.73
• SICD (age equivalent) Expressive	22.6	(11.0)	26	23.5	(10.6)	24	.77
• MCDI Total	70.7	(23.9)	26	69.1	(23.4)	24	.82
• PSI Total # (range 101 to 505)	263.0	(53.2)	26	257.7	(41.8)	24	.70
• PSI Child (range 47 to 235)	124.1	(26.4)	26	123.3	(20.0)	24	.91
• PSI Other (range 54 to 270)	138.9	(30.3)	26	134.5	(26.6)	24	.58
• Stanford Binet IQ &	65.2	(18.2)	15	72.0	(18.9)	13	.34
• Bayley Infant Development Scale &	134.3	(13.6)	11	128.0	(30.5)	12	.53

Notes: * Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

& Data for the Stanford-Binet and Bayley Pretest are only presented for some of the subjects, because some children were functioning too high to be assessed with the Bayley or too low to be assessed with the Stanford-Binet.

Δ Income data was converted from categorical to continuous data by using the midpoint of each interval.

# Higher PSI scores indicate more stress.

Attrition. A total of 10 subjects (4 experimental, 6 comparison) were lost between the times of the first and second posttest. Reasons for the loss of subjects included: (a) lack of interest in continuation (3 experimental, 1 comparison); (b) relocation (1 experimental, 2 comparison); (c) inability to locate (1 comparison); and (d) involvement in another experimental parent training program (2 comparison). In an effort to contact the subject that could not be located, phone calls were made to next of kin and certified letters were sent to the subject. However, this subject could not be contacted despite our best efforts.

Comparisons of pretest variables for those subjects who have dropped out of the study versus those who remained in the study at the time of the second posttest is found in Table 17.3. Non-White mothers were significantly more likely to drop out of the study, and there was a trend for older mothers to drop out of the study. There was also a trend for non-White fathers to drop out of the study. Otherwise, there were no significant differences between the groups.

Intervention Program

This section will briefly describe the basic and expanded treatments and will discuss treatment verification measures.

Basic Intervention (DDI center-based treatment). Children from both the experimental and comparison group received the same basic educational services during the program year. All children were enrolled in a half-day, 5-day-per-week center-based intervention program in which they received small group and individualized teaching sessions from certified special education teachers and trained paraprofessional aides. Certified therapists provided individual motor and speech/language instruction to the children and helped teachers implement appropriate activities in these and other developmental areas. Children were grouped into classrooms based on level of developmental functioning, and the average number of children per classroom was 9.75. During a typical day, children were instructed in developmental areas such

Table 17.3

Comparisons of Pretest Variables for Those Who Have Dropped vs. Those Still in the Study

Variable	Still in the Study			Dropped out of the Study			P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	
• Age in months	47.0	(8.7)	41	45.8	(10.2)	10	.70
• Percent male *	59.0	(.50)	41	64.0		10	.71
• Mother education	13.2	(2.[illegible])	41	14.0	(1.8)	10	.29
• Father education	14.6		40	14.4	(1.9)	10	.84
• Family income Δ	27,062	(14,232)	40	25,250	(11,532)	10	.76
• Mother age	31.9	(5.1)	40	35.3	(5.7)		.07
• Father age	33.6	(5.7)	41	35.4	(7.1)	10	.39
• Percent White - Mother*	88.0			57.0			.05
• Percent White - Father*	90.0		41	64.0		10	.08
• Number of siblings	2.2	(1.2)	41	2.3	(1.4)	10	.86
• Percent of fathers employed as technical/ managerial or above*	67.0		39	80.0		10	.43
• Percent of mothers employed as technical/ managerial or above*	12.2		41	10.0		10	.95
• BDI total raw	305.7	(79.1)	41	288.4	(92.9)	10	.54
• SICD (age equivalent) Receptive	27.1	(8.3)	40	25.8	(10.1)	10	.66
• SICD (age equivalent) Expressive	23.1	(10.1)	40	22.5	(11.6)	10	.85
• MCDI Total	70.9	(22.6)	40	65.8	(65.8)	10	.54
• PSI Total # (range 101 to 505)	263.9	(51.7)	40	246.7	(22.6)	10	.12
• PSI Child (range 47 to 235)	124.3	(25.2)	40	121.4	(14.1)	10	.73
• PSI Other (range 54 to 270)	139.6	(30.5)	40	125.3	(13.2)	10	.16
• Stanford Binet IQ &	66.9	(19.7)	23	69.7	(14.2)	9	.76
• Bayley Infant Development Scale&	130.9	(24.6)	19	131.8	(20.0)	5	.94

Notes: * Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

& Data for the Stanford-Binet and Bayley Pretest are only presented for some of the subjects, because some children were functioning too high to be assessed with the Bayley or too low to be assessed with the Stanford-Binet.

Δ Income data was converted from categorical to continuous data by using the midpoint of each interval.

# Higher PSI scores indicate more stress.

as motor, speech/language, self-help, cognitive, and social skills. As part of these basic services to children, parents were involved in IEP meetings, and teachers occasionally talked individually to parents regarding their child's program as they were dropping children off or picking them up from the preschool.

Expanded intervention (DDI center-based plus parent training). The parent training package used in the experimental group was the Parents Involved in Education (PIE) package developed by Pezzino and Lauritzen (1986). The PIE package consisted of conceptual and hands-on experience in behavioral intervention. Taught by a social worker and the center director, mothers met for group lectures, discussions, and demonstrations. The social worker held a master's degree in social work, and the director has a doctorate in educational psychology. Sessions were 90 minutes in length, and duration of the parent training was one time per week for 15 weeks. This time frame would appear to be about the median of that reported for programs for parents of handicapped children.

Children in the comparison group received the same center-based half-day, 5-day-per-week service as the children in the basic intervention group described above. No attempt was made to train or involve parents in instruction.

Treatment verification. Parent attendance at the parent training sessions averaged 82%, an excellent attendance record for a program of this nature. The test of parent knowledge, given to both the parent training and the comparison group at the time of the first posttest, showed a significant difference in favor of the parent training group (p =.01). These findings give support to the claim that the treatment was received by the parents as it was intended, and that parents gained the knowledge presented in the PIE training package.

Additionally, parents were asked to complete home assignments following training sessions. To verify home assignments, trainers requested that parents fill out and return time tracking sheets indicating hours per week spent with the child. Direct observation was not used because of the costliness and potential obtrusiveness of the methodology. On the average, parents in the parent training group spent more teaching time at home with their children (357 minutes per week versus 311 for the comparison group). Parents in the parent training group spent roughly 12 times as much behavior time as the non-parent training group (12.6 minutes per day versus 1.36 minutes per day).

Cost of alternative interventions. No cost data was available for this study. However, the costs for this year would likely be very similar to those of the Utah Parent Involvement (1986) study, which found that the addition of a parent involvement component to an already established handicapped preschool program cost about $200 more per child per year. Most of this cost was due to personnel. Thus, parent involvement is a relatively modest investment.

Data Collection

Data collection procedures involved the recruitment, training, and monitoring of diagnosticians, and administration of pretest, posttest #1 and posttest #2 measures.

Recruitment, training, and monitoring of diagnosticians. This project has utilized the same diagnosticians at all data collection points (pretest, posttest #1, and posttest #2). Diagnosticians were recruited from graduate programs in psychology and special education at Utah State University. All had Master's degrees and extensive experience assessing handicapped infants and children. They were trained through a lengthy process involving observation of videotapes, a two-day training seminar, and requirement of certification after administering at least five Battelles. Although these diagnosticians were aware that research was being conducted, they were uninformed as to the specific details and hypotheses of the study. They were also unaware of the children's treatment assignments. Shadow scoring was conducted on 10% of the administrations to ensure the validity of the testing procedure.

Pretesting. Pretesting took place in late October and early November of 1985. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI), a measure of child's developmental level. (Stanford-Binet IQ, Bayley Infant Development Scale, and Sequenced Inventory of Communication Development scores were also available through screening testing conducted by DDI prior to the child's acceptance into the program.) The BDIs were administered by a trained examiner who was unaware of the child's group assignment. Testing occurred at the DDI center. In a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed a demographic survey and the Parenting Stress Index (which measures stress and coping behavior in the parent-child system). Information pertaining to the reliability and validity of the Battelle and the Parent Stress Index may be found in the first annual report (White and Casto, 1986). Each of these two sessions lasted approximately 1-1/2 hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttesting #1. Posttesting occurred at the end of the school year in 1986 during the last two weeks of May and the first week of June, or approximately 7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery for the child consisted of the Battelle Developmental Inventory and the Minnesota Child Development Inventory. Information regarding the child's IEP (Individualized Educational Plan) objectives was also obtained. Posttest measures for the parent consisted of the Parent Stress Index; the Family Support Scale (assesses the availability and helpfulness of different sources of support to families); the Family Resource Scale (measures the extent to which different types of resources are adequate in households with young children); a test of parent knowledge concerning the use of behavioral principles taught in the PIE training; the Family Environment Scale (assesses general family functioning in ten areas: cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active recreational orientation, moral-religious emphasis, organization, and control); the Child Improvement Locus of Control (assesses parental beliefs about the factors controlling the improvement of their handicapped child); the Family Index of Life Events and Changes (assesses life events and changes experienced by a family unit); the Impact on Family Scale (measures stress and coping); the Home Screening Questionnaire (a screening instrument designed to describe types of stimulation in the child's home environment that foster cognitive development); and, the Family Adaptability and Cohesion Scales (assesses perceived and ideal levels of family functioning).

The posttest BDI was administered by trained test examiners who were ignorant of subject's group assignments. Parents were paid a $20.00 incentive for completing the posttest battery.

Posttesting #2. A second posttest was conducted on both treatment groups in August, 1987. (During the time between the first and second posttests, parents were not monitored for their application of the principles they learned in the parent training groups.) Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out the parent survey form, the Family Resource Scale, the Family Support Scale, the Parent Stress Index, the Family Adaptation and Cohesion Scale, the Family Inventory of Life Events, and measures of child health and parent satisfaction with services. After the completion of both the BDI and family measures, parents were compensated $30 for their time.

In addition, special permission was obtained to contact the teachers of study participants in the spring of 1988. These teachers were asked to complete a questionnaire developed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement.

As an incentive for teachers to participate, two brightly colored and usable classroom posters were mailed with the questionnaire. If a teacher was requested to complete more than one questionnaire, an appropriate number of posters were supplied with the use of these incentives. This questionnaire had a 100% return rate. (Several children remained in private preschool or home care settings, so data is only reported for children who had moved into the public schools.)

Results and Discussion

Comparisons of child and family functioning at posttests 1 and 2 generally yielded no significant differences. (Analysis of teacher data is currently underway but not available in time for this report.) Univariate analysis of variance and analysis of covariance, with the respective pretests and mother education as covariates, were used. Standardized mean difference effect sizes (ES) were computed to determine the magnitude of the treatment effect in standard deviation units.

Table 17.4 shows the difference between experimental and comparison BDI scores at the time of first and second posttests. There was no statistically significant difference between the experimental or comparison groups on any of the BDI subtest scores or total BDI scores, although there was a trend toward significance in the personal-social domain in favor of the parent training group (p =.06). This difference would appear to "wash out" by the second posttest. In addition, there was a trend toward significance on the Family Support Scale at the time of the second posttest (p =.06) in favor of the comparison group. This difference is more likely to be due to the large number of tests run on the posttest data than to treatment

Table 17.4

ANCOVA Adjusted Means, Standard Deviations, Analysis of Covariance F Values, and Effect Sizes for Child and Family Functioning Measures at First Posttest

Subtest	Posttest #1 Center/Parent Training	%ile	Posttest #1 Center Only	%ile	ANCOVA F	Sig. of F	ES^	Posttest #2 Center/Parent Training	%ile	Posttest #2 Center Only	%ile	ANCOVA F	Sig. of F	ES^
Battelle Developmental Inventory Raw Scores														
Personal and Social	113.69 (25) (28.93)		103.46 (24) (29.61)		3.90	.06	.40	112.60 (21) (24.97)		108.67 (18) (33.50)		.37	.55	.15
Adaptive	65.91 (25) (14.73)		65.71 (24) (14.49)		.01	.94	.01	71.68 (21) (17.25)		71.45 (18) (17.92)		.00	.96	.01
Motor	88.88 (25) (23.64)		88.71 (24) (15.52)		.00	.96	.01	95.48 (21) (27.10)		94.63 (18) (20.49)		.04	.85	.04
Communication	49.48 (25) (14.87)		48.35 (24) (20.29)		.23	.64	.08	53.68 (21) (18.61)		52.88 (18) (21.11)		.07	.80	.06
Cognitive	40.02 (25) (16.22)		39.29 (24) (15.52)		.05	.83	.06	45.51 (21) (17.36)		46.61 (18) (18.95)		.00	.98	-.01
TOTAL BDI	358.00 (25) (85.44)		345.51 (24) (83.57)		.01	.91	.1[illegible]	378.0[illegible] ([illegible]) (93.54)		375.28 (18) (100.31)		.03	.87	.03
PSI@														
Total Stress (range 101 to 505)	251.11 (25) (45.47)	81	256.52 (23) (49.95)	85	.58	.45	.12	269.48 (21) (51.76)	91	253.38 (17) (42.68)	82	1.96	.17	-.31
Total Child (range 47 to 235)	119.83 (25) (45.47)	88	118.90 (23) (49.95)	88	.07	.79	-.04	128.32 (21) (51.76)	94	118.37 (17) (42.68)	87	2.97	.09	-.39
Total Parent (range 54 to 270)	131.47 (25) (45.47)	68	137.27 (23) (49.95)	76	1.46	.23	.21	141.64 (21) (51.76)	80	134.54 (17) (42.68)	72	.99	.33	-.23
FACES*+														
Cohesion	8.92 (25) (7.15)		9.29 (24) (6.36)			.85	.06	8.00 (18) (6.26)		8.32 (19) (6.40)			.88	.05
Adaptability	5.28 (36) (4.75)		4.42 (24) (3.69)			.48	-.23	4.50 (18) (3.99)		3.26 (19). (2.18)			.26	-.57
TOTAL	14.20 (25) (10.14)		13.71 (24) (7.31)			.85	-.07	12.50 (18) (5.85)		11.58 (19) (6.77)			.44	-.14
FRS*$	113.20 (25) (18.50)	40	113.90 (24) (20.80)	41		.89	-.03	115.71 (21) (20.00)	46	115.20 (19) (28.40)	43		.94	.02
FSS*$	31.32 (25)	63	32.70 (24)	69		.68	-.10	25.70 (21)	45	32.50 (19)	66		.06	-.56
FILE*@	11.20 (25)	34	11.60 (24)	29		.80	.07	11.10 (20)	34	10.31 (19)	40		.67	-.12

* T-tests used for analysis

^ Effect sizes computed using the Formula

$$ES = \frac{\text{Parent training adjusted mean - center only adjusted mean}}{\text{SD Center Only}}$$

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details), and positive ESs indicate that the parent training group scored closer to "ideal."

$ Analyses for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

@ For the PSI and File, low raw scores and positive effect sizes indicate lower stress or fewer stressful events for the parent training group. However, lower percentile scores are better on the PSI, while higher percentiles are better on the FILE.

effects. No other statistically significant differences were found for any of the other measures at the time of the first or second posttest.

Additionally, no significant differences were found between the two groups on measures of the child's IEP progress, the Family Environment Scale, the Child Locus of Control questionnaire, the HOME screening questionnaire, or the Impact on Family Scale. Because these measures were taken only at the time of first posttest, and no significant differences were found, these results will not be detailed here. The reader is referred to the 1986 Base Period Report for a complete report on the results of these measures.

The results of the teacher questionnaire may be found in Table 17.5. It can be seen that there is no significant difference between groups at the time of the second posttest, as reported by the children's teachers. Sample sizes are small, however, and some differences may emerge in subsequent follow-up.

Table 17.5
Results of Teacher Questionaires at Posttest #2 -- DDI85

	Center Only			Center-Based + Parent Training				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES$^{\Delta}$
o Teacher rating of parent's:								
Knowledge	15.9	(3.1)	10	15.9	(2.5)	12	.97	.00
Support	16.6	(3.5)	10	17.3	(2.0)	12	.57	.20
Attendance	5.4	(2.6)	10	4.9	(0.9)	12	.56	-.19
o Percent eligible for Special Education services	90.0		10	100.0		12		
o Time in:								
Regular class	29.9		10	12.5		12	.25	
Self-contained class	60.0		10	84.6		12	.14	
Resource room	0.0		10	0.0		12		
Other class	2.6		10	2.5		12	.97	

$^{\Delta}$Effect Size is computed using the formula: $\frac{\text{Parent Training } \bar{X} - \text{Center Only } \bar{X}}{\text{Center Only SD}}$

Subgroup analyses. Additional analyses were done comparing highly satisfied and high attending parents in the parent training group with those parents in the comparison group. In the parent satisfaction analysis, only those parents who rated their degree of satisfaction with the center based program as "high" were included in the analysis. The rationale was that those parents who were satisfied with the training would be more likely to glean from, and implement, the training. The results of this analysis may be found in Table 17.6. No significant differences were found between the two groups in the area of child functioning or parent stress.

Parent attendance was also a variable which was thought to be important in determining the effectiveness of the parent training program. Only those parents who attended more than 50% of the parent training meetings were included in the analysis. The rationale was that those parents who participated most highly were likely to learn more and be more diligent about implementing the principles taught with their children. These results may also be found in Table 17.6. The only significant difference between the two groups was that parents in the highly participating parent training group experienced higher stress due to the child ($\underline{p} = .05$) than did the parents who did not receive parent training. There was also a trend for total stress to be higher in the parent training group. This finding may be thought to lend support to Clarke-Stewart's (1982) suggestion that perhaps parent training may serve to make the mother more anxious or unsure. However, this finding must be considered tentative until further replication verifies it. This stress finding might be due more to the immediate circumstances of the mothers in the high attendance group at the time of the second posttest, and the stress effect could wash out by the next point of measurement. Future study with this group is necessary in order to answer these questions.

Conclusions

In summary, this study found that parent training was not effective in its first year in producing immediate or delayed improvements in child developmental level. High attending parents in the parent training group were more stressed at the time of the second posttest than were the parents in the comparison group, although parent

Table 17.6

Means, Standard Deviations, Analysis of Covariance F Values, and Effect Sizes for Battelle Developmental Inventory and Parenting Stress Index Scores

Subtest	Center/Parent Training	Center Only	F	Sig. of F	ES^	Center/Parent Training	Center Only	F	Sig. of F	ES^
Battelle Developmental Inventory Raw Scores										
Personal Social	113.36 (18) (25.39)	103.46 (18) (33.50)	.59	.45	.20	110.54 (18) (25.32)	108.92 (17) (34.03)	.05	.82	.06
Adaptive	70.76 (18) (17.48)	71.18 (18) (17.92)	.01	.90	-.03	71.68 (16) (17.76)	72.43 (17) (18.36)	.03	.67	-.05
Motor	93.35 (18) (26.76)	93.93 (18) (20.49)	.02	.90	-.03	95.60 (18) (28.78)	96.39 (17) (21.06)	.03	.87	-.03
Communication	53.33 (18)	52.95 (18)	.01	.91	.03	54.26 (18)	54.28 (17)	.00	.99	-.01
Cognitive	46.39 (18) (15.63)	45.45 (18) (18.95)	.06	.82	.08	47.67 (18) (17.94)	47.81 (17) (19.16)	.07	.97	-.01
TOTAL BDI	374.95 (18) (92.60)	373.11 (18) (100.31)	.01	.91	.03	377.80 (18) (99.52)	380.79 (17) (101.71)	.03	.87	-.04
PSI⁺										
Total Stress	263.42 (18) (46.03)	252.39 (17) (42.68)	1.06	.31	-.22	276.60 (18) (47.31)	254.38 (16) (44.06)	3.26	.08	-.45
Total Child	127.02 (18) (24.65)	117.83 (18) (27.33)	2.50	.12	-.39	131.67 (18) (27.23)	118.80 (16) (28.18)	4.34	.05*	-.53
Total Parent	136.92 (18)	134.03 (17)	.20	.66	-.10	145.61 (18)	134.90 (17)	1.96	.17	-.36

* $p < .05$

** $p < .01$

^ Effect sizes computed using the Formula ES = $\frac{\text{Parent training adjusted mean - center only adjusted mean}}{\text{SD Center Only}}$

⁺ Low PSI scores indicate less stress.

satisfaction with services made no difference. However, replication is necessary in order to ascertain the validity of this finding.

Future Plans

No testing of the DDI 1985 cohort was conducted in 1988. However, this group will be retested in the summer of 1989, at which point the Battelle and family functioning measures will be administered. We will continue to contact the children's teachers for reports of their progress as they move through their school years.

PROJECT PITCH

Project #18

COMPARISON: Moderately speech disordered, 3 and 4 year olds, home-based, parent-centered speech therapy services versus center-based, child-centered speech therapy services.

LOCAL CONTACT PERSON: Bunny McCoun, Speech Therapist, Project PITCH

EIRI COORDINATOR: William Eiserman

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 10-8-1988

Rationale for Study

Over the past 20 years, parent involvement issues have been increasingly emphasized in early intervention activities. First, in 1968 the Handicapped Children's Early Education Assistance Act included a two-part directive regarding parents of handicapped children, which specified as follows: "First to provide the parents with counseling and guidance on how they can effectively respond to the special needs of their handicapped children," and second to "enlist the help of parents as allies and associates of educators to provide a total program" (P.L. 90-538, Note 6, p. 4). Later, in 1975, the Education for All Handicapped Children Act, P.L. 94-142, stated that "such programs shall involve activities and services designed to encourage the participation of the parents of such children in development and operation of any such programs" (Sec. 623, p. 35). Most recently, P.L. 99-457 clearly specifies that for each handicapped infant and toddler, an Individualized Family Service Plan must be developed that includes a statement of family strengths and needs relating to enhancing the development of the handicapped child. In addition, Congress expects that the 3- to 5-year-old preschoolers' IEPs will include instruction for parents so that they can be knowledgeable and actively involved in their child's progress (Weiner & Koppelman, 1987).

The question of how to involve parents and, more specifically, what type of instruction to provide them remains an issue of much debate. One common approach that has appeared to be quite successful in involving parents is in providing direct service to their children. In their review of 162 early intervention studies that included a substantial parent involvement component, Gatling and White (1987) subdivided studies into two main categories based on the types of parent involvement used: (a) Parent assistance to the child, and (b) support provided to parents and family. Gatling and White demonstrated that 81% of studies with parent involvement components were limited primarily or solely to involvement of the first type, parent assistance to child, and were specifically those that used parents as developmental therapists for their children.

Most studies that have considered the effects of parents as therapists conclude that parents can provide effective early intervention services. Reeder and Casto (1984) reported that over 150 studies have been cited in recent reviews of early intervention literature that purportedly demonstrate that parents can indeed be effective teachers of their disadvantaged, at-risk, and handicapped children (Bronfenbrenner, 1974; Comptroller General, 1979; Dudzinski & Peters, 1977; Garland, Swanson, Stone, & Woodruff, 1981; Goodson & Hess, 1975; Gordon, 1969; Heinz, 1979; Reisinger, Ora, & Frangia, 1976; Simeonsson, Cooper, & Scheiner, 1982; Weikart, 1975). Specifically, several reviewers have suggested that parent involvement is a crucial component to an early intervention program because it can lead to an increase in self-esteem for both child and parent as well as increased self-confidence in mothers (Bronfenbrenner, 1974; Comptroller General, 1979; Dudzinski & Peters, 1977; Honig, 1980; Kysela, Hillyard, McDonald, & Ahlsten-Taylor, 1981). Heinz (1979) reported that a child's academic achievement motivation is contingent on parent involvement, while Comptroller General (1979) concluded that parent involvement in early intervention was associated with reduced health, social, and educational problems in later years of the child's life.

One of the areas in which parents have been commonly used as therapists to their children is language and speech remediation. A number of studies have documented that parents can effectively function as speech and/or language therapists for their children and that the children experienced significant benefits (Levenstein & Sunley, 1967; McDonald, Blott, Gordon, Spiegel, & Hartmann, 1974; Seitz & Riedell, 1974; Miller 1983; Arnold, Myette, & Casto, 1986; Hatten & Hatten, 1971). In the Levenstein and Sunley study (1967), for example, an experimental group of six mother-child dyads who were trained to use the Verbal Interaction Stimulus Materials (VISM) were shown to have made significant verbal IQ gains over the control group of five mother-child dyads.

It should be noted, however, that several reviewers (Ambron-Robinson, 1977; Parker & Mitchell, 1980; Simeonsson et al., 1982) have cautioned that many of the studies reporting the effects of parent involvement experienced methodological weaknesses. Studies focusing on parents as speech and/or language therapists have, unfortunately, been no exception to these threats to validity. Many studies used neither random assignment nor appropriately matched control groups. Naive data collectors were seldom used, and interrater reliability scores on target variables were frequently not obtained. Although a wide range of dependent measures have been used in the studies that have been reviewed, often these measures were nonstandardized, making it difficult to make comparisons across studies.

For example, in an early study of parent involvement, Sommers et al. (1959) compared children's progress in correction of functional speech disorders using two groups, both receiving clinical services. The mothers of the experimental group received training in auditory discrimination and speech development in addition to observing their children in therapy, while the control group received only clinical service. Although Sommers claimed a "trend" toward parent success compared to the control group, results were inconclusive because of a number of methodological weaknesses. Perhaps the most glaring shortcoming of the study was its brevity; the study covered a 3.5 week period with a 9-week follow-up. In addition, there were a number of procedural concerns: (a) parents were selectively treated, i.e., parents judged to be "sufficiently mature mentally and emotionally" were given drill work for their children, others were not; (b) standardized instruments were not used for testing; (c) naive testers were not used; (d) groups were small (10); and (c) verification of treatment was not provided.

Unfortunately, the methodological weaknesses of the Sommer's study typify much of what the research on parent involvement (including, but not limited to, that which has focused specifically on parents as speech and/or language therapists) has suffered from since the Sommers' study was conducted in 1959. The concerns raised about the inconclusiveness of previous studies and the quality, or actually the kind of research that has been conducted, should not be interpreted as a conclusion that parental involvement is not a critical component to early intervention, nor as a conclusion that other research strategies have no place in the study of parent involvement in early intervention. Rather, any conclusions that are eventually drawn about the effectiveness of parent involvement should, and undoubtedly will, be based on corroborating information experientially obtained via a variety of research strategies, including quasi-experimental studies, single-subject studies, naturalistic case studies, and experimental group studies. One of the most valuable research strategies, however, that has not been adequately employed in addressing questions pertaining to parent involvement is experimental group studies using randomized designs, naive diagnosticians, and a wide variety of standardized measures. Such studies could play the part of major contributors to the body of information on the costs and effects of parent involvement in early intervention before any general conclusions can be drawn about the impact of parent involvement.

Thus, the issue of using parents as developmental therapists, and, specifically, as speech and language therapists for their children, appears to be of great interest to the field of early intervention. Using a randomized design, naive diagnosticians, and a wide variety of standardized measures, the present study examined the costs and effects of parents as speech therapists to their moderately speech delayed children.

Methods

This study was conducted at Project PITCH in the Granite School District in Salt Lake City, Utah, in which forty 3- to 5-year-old children with speech disorders were randomly assigned to either a traditional, clinical, center-based, child-centered program in which children received service directly from a professional speech pathologist, or to a home-based, parent-centered program in which children received services from their parents who were being trained bi-monthly by a professional speech pathologist.

Project PITCH (Preschool Intervention and Training for Children with Handicaps) has served preschool handicapped and developmentally delayed children (age birth to 5 years) within Granite School District since 1975. Since its beginning, Project PITCH has provided a home-based service with emphasis on training parents to provide special intervention services for their children. Special education teachers, speech pathologists, a social worker, and a registered nurse comprised the Project PITCH staff that provided services to approximately 100 children during a 9-month school year. Forty of these children solely required speech and language related services.

Based on a developmental evaluation using the Brigance Diagnostic Developmental Inventory of Early Development conducted by one of the staff members, it was determined whether a particular child demonstrated serious developmental delays or a handicapping condition that would interfere with his/her learning. The specific criterion for inclusion in the program was that the child be at least 1 year delayed in at least one developmental domain. Two speech pathologists provided the speech related services examined by this study. Each carried a case load of 20 children and wrote an Individualized Educational Program for each child with assistance from the child's parents.

Program staff reported that data on student progress had been maintained in the past by the facilitator and had typically demonstrated that parents were able to work successfully as teachers for their preschool developmentally delayed or handicapped children and were committed to their role in providing this service. While the traditional PITCH service model was based on the assumption that providing service via parents as interventionists is more cost-effective than traditional child-centered therapy, PITCH personnel had never tested their assumption and were interested in an evaluation that would be as objective as possible. Hence, Project PITCH personnel supported this research project with the objective of determining whether involving parents in direct service as therapists to their children is indeed as effective as is a traditional clinical model with minimal parent involvement.

Research activities were coordinated by the two speech therapists who communicated directly with the EIRI site coordinator. Both therapists were informed of all research procedures, and regular weekly contacts with the EIRI coordinator assured that these procedures were followed.

Subjects

A total of forty 3- to 5-year-old children and their parents were included as subjects in the study. The following section will summarize the methods used in recruiting and assigning subjects to treatment groups. Additionally, the results of the assignment to groups will be presented with respect to demographic characteristics.

Recruitment. Children were identified for speech therapy services in the Granite School District through several processes. The majority of those identified were children of parents who, suspecting a speech problem, contacted their school or school district that, in turn, referred the children to the Project. Other referral sources included the State Department of Health, local pediatricians, public health nurses, and social services agencies.

Another means for child identification was less formal, although a proven effective means: the parent grapevine. Parents who had been served by Project PITCH in previous years were asked to refer others to the program who might need service. Additionally, all schools in the district informed their teachers, who then informed parents of the Project PITCH services that were available. Also, a special article in the area newspaper and public service radio spots informed parents of Project PITCH's available services.

Children qualified for inclusion in the project on the basis of age and speech articulation abilities (children 3-5 years of age, performing in the lower 20th percentile on the Goldman-Fristoe, Sounds-in-Words Subtest) qualified. Additionally, these children were at least 6 months to a year delayed in one or more of the domains of the Battelle Developmental Inventory. Of the 41 children identified for services, 40 of the parents elected to participate in the research. The parent who did not choose to participate was only interested in obtaining direct therapy for the child in the home; a service provided by neither of the treatments in the study.

Assignment to groups. Children who met the age and speech requirements were included as potential subjects. After receiving informed consent agreements from the children's parents, the Project PITCH therapist in charge of coordinating child enrollment contacted the EIRI coordinator and provided the articulation status and age data (the two stratification variables). After stratification on these variables, subjects were randomly assigned to groups by the EIRI coordinator to ensure that no program staff had knowledge of what treatment a particular child would receive. Additionally, since children were enrolled continuously over a 2-month period, the dates in which children were identified were carefully tracked to ensure that children were assigned to treatments in the order in which they were identified.

Demographic characteristics. The subject pool of 40 children, 3 to 5 years of age, was enrolled on a continual basis during the first 2 months of the school year beginning September 1, 1987. Prior to the referral for the complete testing battery, all 40 of the subjects were screened and determined to be moderately speech disordered, using articulation screening cards (National Students of Speech and Hearing). Of the 40 children who qualified for service, 22 were 3-year-olds while 18 were 4-year-olds. At the time of enrollment, subjects in the child-centered (center-based) program ranged in age from 37 to 57 months (mean = 46.2, SD 5.32), while subjects in the parent-centered (home-based) program ranged in age from 39 to 58 months (mean = 48.0, SD 6.47).

As can be seen in Table 18.1, no statistically significant differences ($p < .10$) between the two treatment groups were found on any of the demographic variables. The sample population was predominantly male, consisting of 33 males and 7 females, who, with one exception, lived in homes with both the mother and father. The predominance of males requiring early intervention services is consistent with findings of several studies that have indicated that males tend to comprise approximately 71% of the preschool children requiring speech and language therapy (Department of Education, 1984). The preponderance of children in this sample who were white and from two parent homes, however, are not representative of the total population of children who receive speech therapy. Thus, these variables should be kept in mind when generalizing the findings of the study to other populations.

This sample represents a somewhat diverse group with respect to parent educational and income levels. A total of 10 (25%) of the mothers' highest completed

Table 18.1
Comparability of Groups on Demographic Characteristics for the PITCH Study

	Center-Based Child Centered			Home-Based Parent Centered			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/88	46.2	(5.32)	20	48.0	(6.47)	20	.34
• Age of mother in years	32.7	(5.64)	20	33.0	(4.72)	20	.84
• Age of father in years	35.7	(5.92)	20	34.7	(7.36)	20	.87
• Percent male*	85%			80%		20	.69
• Years of Education for Mother	14.5	(1.85)	20	14.0	(1.64)	20	.37
• Years of Education for Father	14.45	(1.87)	20	14.5	(1.70)	20	.79
• Percent with both parents living at home	90%		20	100%		20	.15
• Percent of children who are caucasian*	100%		20	100%		20	1.00
• Hours per week mother employed	11.3	(17.09)	20	7.95	(13.27)	20	.49
• Hours per week father employed	40.5	(11.46)	20	40.5	(1.84)	19	.99
• Percent of mothers employed as technical managerial or above*	15%		20	20%		20	.69
• Percent of fathers employed as technical managerial or above*	70%		20	65%		20	.74
• Total household income	$26,149	(9,262)	20	$28.749	(8,131)	20	.35
• Percent receiving public assistance	10%		20	10%		20	1.0
• Percent with mother as primary caregiver*	95%		20	100%		20	.32
• Percent of children in day care more than 5 hours per week*	10%		20	0%		20	.15
• Number of siblings	2.3	(1.42)	20	3.3	(1.92)	20	.08
• Percent with English as primary language	100%		20	100%		20	1.00

Notes: *Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

year of education was the 12th grade. While the other 30 (75%) of the mothers indicated some college education, a total of 26 (65%) of the 30 reported that the high school diploma was the highest diploma received. Of those who obtained college educations, 12 (30%) received bachelor's degrees and 2 (5%) received master's degrees. Although not statistically different, it should be noted that there were almost twice as many mothers in the center-based group (9) who received college degrees than in the home-based group (5). This finding is important because it has been suggested (Scarr & Weinberg, 1983) that parent education correlates positively with child performance. Hence, the home-based group may have been slightly disadvantaged in this regard.

With respect to economic status, parents' incomes ranged from $11,000 to over $50,000 per year. A total of 25 (63%) of the parents reported a yearly income of less than $30,000, while 12 (30%) of the parents reported a yearly income between $30,000 and $40,000 and 3 (8%) reported a yearly income over $40,000, only one of whom reported an income greater than $50,000.

It is also interesting to note that of the 40 mothers involved in the study, 25 (63%) were unemployed and 15 (37%) were employed, although only 5 (13%) reported working full-time (40 hours per week or more). Since this study examined the effects of parents (mothers) as home interventionists, it is especially important to note that there was no significant difference between the groups with respect to the number of mothers unemployed nor with respect to the number of hours employed per week.

Intervention Programs

Two alternatives to providing speech therapy services were compared in this study; a traditional, center-based, child-centered program and a home-based, parent-centered program. Two therapists were employed, one for each program, who devoted 20 hours per week to providing their respective services. These services are described below.

Center-based, child-centered program. One group of children (Group I) received a traditional clinical approach in which small-group therapy (two children) was solely provided by a professional speech pathologist. This service was delivered in a center-based setting for 1 hour each week for 7 months.

Using the pretest results, the therapist for Group I paired children with other children with similar sound errors. Common speech therapy procedures were then followed using phonetic and phonological approaches. The phonetic approach focused on the production of speech sounds (e.g., sound placement was demonstrated followed by sound practice to enable the children to learn to discriminate between the substituted, distorted, or omitted sound and the correct sound). When the children were able to auditorily discriminate between their habituated sound substitution, distortion or omission, and the correct sound, they were trained in a sequence of first using the sound in nonsense syllables, then in single-word production, next in short phrases, and finally in sentences for carry-over into normal connected speech. The phonological approach attempted to revise the child's individual patterns of misarticulation or the distinctive features unique to the child's verbalization (e.g., the child's distinctive systems of verbalization were diagnosed and treatment involved shaping procedures to gradually develop the correct speech pattern). In addition to articulation training, the children played sound games and were involved in various activities that reinforced language acquisition and the use of the newly acquired sounds.

All data on the children's progress were maintained by the therapist. The parents were, however, directly involved in setting goals for the children's Individualized Educational Program, as is required by P.L. 99-457. The therapist in the center-based group typically spent 10 to 12 hours per week in service and 8 to 10 hours per week in preparation and record keeping activities.

Home-based, parent-centered program. In contrast to the traditional speech therapy delivery, a second group of children (Group II) received therapy at home from their parents who were trained as speech para-professionals. Prior to their random group assignments, Group II subjects were also tested for developmental skills, language acquisition, and articulation accuracy; the results of which were used in determining the program for each individual parent and child.

The training of the parents occurred during 40-minute bi-monthly visits made by a professionally trained speech pathologist over a 7-month period. The initial teaching sessions with the parent focused on reviewing the child's testing and determining the goals to be included in the Individual Educational Program. Also, the parent was instructed as to which sound was most appropriate to begin working on the physiological placement for that sound and the beginning procedures to be followed in practicing the sound. The therapist modeled these initial steps and asked the parent to demonstrate the procedure to assure understanding.

Follow-up visits included discussions on the fundamental procedures in correcting articulatory problems, techniques in auditory training, and the appropriate sequence for teaching sounds as followed in Group I (isolation, nonsense syllables, single words, and connected speech). Parents were provided with task analyzed procedures so that the teaching could progress as the child reached the criteria. They were also instructed on ways to elicit language from their child by becoming more responsive to cues given by the child. Additionally, parents were taught charting techniques and data keeping procedures.

As each teaching skill was introduced, the therapist modeled the technique with the child, observed the parent working with the child, and provided formative feedback. The therapist also maintained anecdotal accounts documenting parent performance on teaching tasks and the quality of parent service. Materials such as sound cards, sound games, and other exercises for speech and language development were furnished by the therapist at each visit. These materials enabled the parent to vary the activity, maintain the child's interest, and to also learn a variety of ways to work with speech disorders. Materials given to parents were the same as those used by the therapist in Group I. Also, parents were encouraged to be innovative and create their own methods of keeping the child engaged in practice.

Thus, the speech pathologist in Group II assumed the responsibility of training the parent, while the parent assumed the responsibility for carrying out the child's therapy and maintaining the data. Parents were encouraged to work daily with the children and to maintain a minimum schedule of 20 to 30 minutes, four times weekly.

The therapist in the home-based program typically spent approximately 7 hours in therapy, 4 to 5 hours in transit, and between 7 to 8 hours in preparation and record keeping per week.

Treatment verification. Treatment verification activities were conducted continually between December 1, 1987 and March 15, 1988. The purpose of these activities was to document the early intervention program at Project PITCH and to verify that the alternative treatments were being implemented as was intended. Additionally, these activities were used to identify areas needing improvement in the program and means for meeting these needs once they are identified.

* **Attendance Data.** Attendance data were kept continually by each interventionist, and completed forms were submitted monthly to the EIRI site coordinator. The coordinator reviewed attendance to determine if any subjects' attendance was irregular. If this was found, the coordinator arranged to talk with the intervenor to see how attendance for that particular child could be encouraged. Attendance data were then compiled by an EIRI clerk who calculated each child's attendance rate.

Attendance was quite high in both groups. The mean attendance rate in the center-based treatment was 88%, ranging from 74% to 100% attendance. The mean attendance rate in the home-based treatment was 96%, ranging from 85% to 100% attendance. Although attendance was quite high in both groups, this difference in attendance between groups was found to be statistically significant ($p < .001$). As might be expected, this finding indicates that the home-based program was more conducive to higher rates of attendance since the intervention was brought to the child's home.

* **Parent Involvement** Data. Four procedures were used for assessing the level of parent involvement: (1) parents were interviewed over the telephone twice during the year by a third party interviewer from EIRI; (2) parents were inferentially evaluated by the two therapists regarding their involvement with their child who was receiving therapy; (3) parents were interviewed (after the inferential evaluation) by the therapists regarding their involvement; and (4) parents were ranked using the Quality of Parent Involvement Form.

The results of these procedures (see Table 18.2) indicate that the parent reports to the therapist and their reports to a third party interviewer correlated significantly ($r = .459$, $p = .001$) with a 65% agreement rate and indicated that parents in the home-based group reported spending significantly more minutes per week working with their child than parents in the center-based group. While correlating with each other significantly, it is interesting to note that parents' reports given to the therapist were noticeably higher than reports of time given to the third party interviewer. Additionally, there was some indication during the interviews that parents in the center-based group were defining "time spent with child" differently from parents in the home-based group. Center-based parents seemed to be more liberal in their definition, including time spent reading with the child or incidental conversation, while home-based parents mainly included structured activities aimed at

Table 18.2

Comparability of Groups of Pretest Parent Involvement for the Project PITCH Study

	Center-Based Child Centered			Home-Based Parent Centered				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	Effect Size$^{\Delta}$	P Value
Estimates by Therapists (average # of minutes per week)	131.1	(51.72)	20	132.9	(52.86)	20	.04	.91
Parents' Reports to Therapists 1 = < 1 hr. per week 2 = 1-2 hrs. per week 3 = 2-3 hrs. per week 4 = 3-4 hrs. per week 5 = > 4 hrs. per week	3.1	(1.76)	20	4.0	(1.34)	20	.61	.10
Parents' Reports to Third-Party Interviewer 1 = < 1 hr. per week 2 = 1-2 hrs. per week 3 = 2-3 hrs per week 4 = 3-4 hrs. per week 5 = > 4 hrs. per week	2.4	(1.73)	20	3.7	(1.099)	20	.94	.01
Parents' Understanding of Child's Condition 1 = low 2 = average 3 = high	2.2	(.47)	20	2.6	(.50)	20	.78	.03
Parents' Support of Child's Program 1 = low 2 = average 3 = high	2.4	(.51)	20	2.7	(.60)	20	.39	.27

$$^{\Delta}\ ES = \frac{\text{Home-based adj. } \bar{x} - \text{center-based adj. } \bar{x}}{\text{Pooled SD}}$$

speech remediation. Thus, while the results indicated that the home-based parents reported spending more time working with their child than the center-based parents, there is some question about what this time variable meant for the center-based parents. Consequently, it was determined that only parent time data could be used in posttest subgroup analyses for the home-based group for whom the data appeared more reliable.

Interestingly, reports made by the therapists prior to formally interviewing parents about their time spent working with their child did not correlate significantly with either of the other reports of parent time (i.e., 50% and 40% agreement rating were found between the inferential ratings and the third party interview and therapists' interviews, respectively). Both therapists estimated the parents in their group to be spending approximately 1-1/2 hours per week. For the home-based therapist, this estimate was noticeably lower than either of the parents' reports of their time. Although less noticeable, the center-based therapists' estimate was also considerably lower than the parents' reports of their time.

The fact that these data do not correlate highly with one another suggests that parent involvement is very difficult to assess without using observational techniques of which were beyond the scope of this study. For purposes of treatment verification, however, these data, especially the data reported by the parents themselves, do suggest that parents in the parent-centered group tended to be more involved with their child's development than the parents in the child-centered group, although an exact estimate of time differences is difficult to make.

Table 18.2 also presents the results of the interviewers' ratings of the Quality of Parent Involvement. These results suggest that the groups were comparable with respect to parents' level of support for their child's respective program. As can also be seen, the parents in the home-based group were rated significantly higher than parents in the center-based group with respect to knowledge of their child's condition.

* **Supervisor's Evaluation of Therapists.** The PITCH supervisor conducted observational evaluations of the two therapists twice during the year. Both evaluations indicated that the therapists were performing "outstandingly" in each of the areas evaluated: academic expectations, academic learning time, classroom/case management, curricular congruence, direct instruction, homework, parental involvement, rewards for achievement, teacher questioning practices, monitoring student progress and evaluative feedback, and reinforcement of self-concept.

* **Videotaping of the Treatments.** Two intervention sessions were videotaped in each of the treatments with the objective of documenting the activities used in a typical session. The EIRI coordinator and a third-party evaluator then observed the videotapes to determine if the sessions reflected the types of practices specified for each treatment. The third-party evaluator was asked to describe each treatment in a narrative and specify how each was similar and different from each other. The results indicated that both interventions were consistent with what was proposed.

* **Anecdotal Records Kept by Therapists.** Anecdotal records were kept by each of the therapists. These records documented the types of therapy covered in each session and reflected the respective approaches described above.

Site review. A formal site review was conducted by the EIRI coordinator to ensure that the treatments were being implemented as intended and that all predetermined procedures were being followed as specified. The site review consisted of the following: a cumulative review of six subjects' folders, direct classroom and home visit observations, interviews with interventionists, and interviews with three parents.

Review of services for children. Most of the criteria for adequately providing services to children were being fully met. The project had an explicit philosophical approach that was accompanied by written goals and objectives of the program. One area in which the criteria were not met pertained to data collection procedures. Although an attempt was made to specify the exact performance level needed in order to advance to the next teaching goal, this was not done as consistently as it should have been.

Aside from the few problems noted, the site met the criteria most of the time. Thus, the site received a mean rating of 4.6 of a possible 5 for this area of the evaluation.

Interactions between staff and children. Both interventionists were rated on the criteria pertaining to their interactions with children they serve. Each fully met each of the criteria, resulting in a mean rating of 5.

Curriculum and administration. The site fully met these criteria and averaged a rating of 5.

Physical Arrangements. While these criteria did not apply to the home-based service being provided, it did apply to the center-based service. Inasmuch as it was applicable, these criteria were fully met. The center-based therapist operated in a very large classroom that the children had to themselves.

* **Therapist's Use of Time.** In order to determine if therapists were actually spending similar amounts of time to deliver services to 20 children, they were asked to track their time over a week period, twice during the year. The results of the time tracking indicated a negligible difference between the total hours spent by the two therapists each week. The first time tracking sample indicated that the center-based therapist spent 19.5 hours preparing for and delivering services to her case load while the home-based therapist spent 18.5 hours. The second time tracking sample indicated that the center-based therapist spent 20 hours while the home-based therapist spent 17 hours. Both therapists reported that their time varies from week to week between 1 to 2 hours either direction.

Cost of alternative interventions. Table 18.3 presents the costs of each program and the costs for each program including parent time valued at the average wage of $10.50 per hour. Cost per child was calculated for each resource used by the program using the ingredients approach described earlier. PITCH resources included: direct service and administrative personnel, parent time, facilities, staff

Table 18.3
Costs Per Child for PITCH (1987-88)

Resources	Center-Based (N=20)	Home-Based (N=20)
Agency Resources		
Personnel:		
Direct Service	$1,504	$1,760
Administrative	143	143
Parents	0	0
Facilities		
Classroom	113	0
Office[1]	227	282
Transportation	82	77
Materials/Supplies	25	25
Subtotal	$2,093	$2,287
Contributed Resources		
Parent Intervention Time	0	686
Parent Transportation	596	0
Subtotal	596	686
Total	2608	2973

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[1] Calculated using district indirect cost of 14.8%. Includes facilities, equipment, capital improvements, and some administration.

and child transportation, and materials and supplies. Personnel costs included salary and benefits according to FTE devoted to each alternative intervention. It should be noted that the difference in direct service cost reflects that the home-based program had a therapist who had been on staff for a longer period than the therapist in the center-based program. This additional salary cost for the home-based group ($256) does not reflect a necessary cost difference, since each program could have been implemented with therapists of equal pay. Transportation costs for the center- and home-based programs reflect the mileage reimbursements provided to parents and the home-based therapist, respectively.

The contributed resources in Table 18.3 were computed by valuing parent's time at the standard rate of $10.50 per hour. As has been shown, it is difficult to precisely determine the number of hours parents spent with their child in each of the programs. However, costs of each treatment can be estimated as follows. The center-based intervention required parents spend time in transportation; hence, it was estimated that parents spent approximately 1 hour, 45 minutes per week transporting their child to and from therapy. The home-based intervention required parents spend approximately one-half hour per day, 4 days per week working with their child on speech related activities in addition to the actual 40-minute intervention sessions twice per month. Some parents spent less than the required time, some spent more. Valuing parents time based on the required time gives a "ball park" estimate of the cost of parent time for the home-based intervention over the 7-month period of the study.

Data Collection

Several measures were used to examine the effects of the two types of interventions with the speech disordered subjects. The focus of the data collection was on assessing speech production, language development, cognitive/social development, and family adaptation. In addition to the core measures used in all of the 18 sites, several language measures, a naturalistic language sample, and parent questionnaire were used to address research questions unique to this study.

Recruitment, training, and monitoring of diagnosticians. Three diagnosticians completed extensive training prior to administering the Battelle Developmental Inventory. All of the diagnosticians had master's degrees and extensive experience assessing handicapped infants and children. One speech pathologist, holding a master's degree, completed all of the speech and language tests, also after being trained. Each tester was naive to the subject assignments of those they tested. Shadow-scoring was conducted on 10% of the BDI administrations and resulted in a mean of 96% interrater agreement.

Pretesting. Parents of each child participating in the study completed an informed consent form and provided demographic information. The Battelle Developmental Inventory (BDI) was used in this study because several of the BDI domains were especially relevant to this study (cognitive, communication, and personal/social). Additionally, parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, the Family Inventory of Life Events and Changes, and the Family Adaptability and Cohesion Evaluation Scales. The BDI was administered by a trained diagnostician who was unaware of the child's group assignment. Testing occurred at the center, ensuring a controlled testing environment for all subjects. The parent, usually mothers, completed the family measures following completion of the BDI. The Family Support Scale was given to the mothers to take home if they had a spouse or spouse equivalent who could complete it.

The diagnosticians completed the testing report and then sent all data to EIRI via certified mail.

Additionally, the following language, speech, and articulation tests were given to all subjects by a trained speech therapist who was also unaware of the subjects' assignments.

Goldman-Fristoe Test of Articulation (Sounds-in-Words Subtest). The Goldman-Fristoe Test of Articulation provides a systematic means of assessing an individual's articulation of consonant sounds. It is a nationally normed test of articulation and has proved to be a reliable and valid instrument in the field of speech pathology. The Sounds-in-Words Subtest gives a raw score that is compared with national findings that, in turn, provides a percentile ranking comparing the subject's performance with other subjects of the same age.

Patterned Elicitation Syntax Test. The Patterned Elicitation Syntax Test (PEST) is designed to determine whether a child's expressive grammatical skills are age appropriate. In addition to providing age-referenced norms, the PEST is designed to provide information on a broad range of grammatical structures that typically occur in children's speech.

Preschool Language Scale (PLS). The Preschool Language Scale was designed to detect language strengths and deficiencies. It consists of two main sections: Auditory Comprehension and Verbal Ability. A supplementary articulation section is also included. The scores that are obtained are equivalent language age scores for each section.

Posttesting. Posttest measures consisted of the BDI, parent measures, and the language, speech, and articulation measures discussed above with the exception of the PEST, which was replaced by two additional language measures described below. Additionally, a parent satisfaction with the treatment questionnaire and parent report of child's health were administered to the parents.

Test for Auditory Comprehension of Language (TACL-R). The TACL-R measures the subject's auditory comprehension of language by assessing skills in the areas of grammar, syntax, and morphology. The instrument enables the examiner to assign the subject to a development level of comprehension based on his/her performance.

Naturalistic Language Sample. Following the suggestions made by Barrie-Blackley, Musselwhite, and Rogister (1978), Shriberg and Kwiatkowski (1980), Miller (1981), and Bloom and Lahey (1978), a naturalistic language sample protocol was developed. The protocol was developed to be used twice: (1) one sample taken between parent and child, (2) one sample taken between therapist and child. The protocol consists of procedures and materials to be used in collecting the sample. The sample will result in many different types of data, both qualitative and quantitative, in four domains: articulation, pragmatics, semantics, and syntax. The advantage of such a sample is that actual language is being examined allowing for assessments of generalized skills (as collected in the parent/child sample) and optimal skills (as collected in the therapist/child sample).

Results and Discussion

The following section will present the results of the study with respect to the following research questions:

1. To what extent are the two treatment groups comparable on pretest measures of child and parent functioning?
2. To what extent are there posttest differences between the two treatment groups on measures of child functioning?
3. To what extent are there posttest differences between the two treatment groups on measures of family functioning?
4. What is the relationships between the costs and the effects of each intervention?
5. To what extent are there differences between other subgroups in the two treatment groups, such as groups determined by the stratification variables (i.e., child age, mother education, and level of parent involvement)?

Each of these questions will be addressed in sequence in the section that follows.

Comparability of Groups on Pretest Measures

The two treatment groups were compared at pretest according to child functioning and family functioning variables. These results are reported below.

Child functioning. Table 18.4 contains pretest BDI, Goldman-Fristoe, PEST, PLS, and BDI scores. There were no statistically significant pretest differences ($p < .20$) found between the two treatment groups on any of the measures of child functioning. The results of the pretest provides a good indication of the performance level of the subjects in the study. For example, results on the BDI indicated that the children in the study were mildly handicapped, experiencing delays in the personal-social and communication (total and expressive) domains. The Goldman-Fristoe Test of Articulation Sounds-in-Words Subtest assesses the communication domain more sensitively than the BDI and, subsequently, indicated that

Table 18.4

Comparability of Groups on Pretest Child Functioning Measures for the Project PITCH Study

	Center-Based Child Centered			Home-Based Parent Centered				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	Effect[Δ] Size	P Value
Age of Child in months at pretest	46.2	(5.32)	20	48.0	(6.47)	20	.31	.34
Goldman-Fristoe--Sounds in Words-- # of errors	40.0	(10.88)	20	40.0	(10.42)	20	0	1.0
Goldman-Fristoe -- Sounds in Words-- Percentile Rank	4.2	(4.39)	20	4.4	(3.34)	20	.05	.88
* PEST - Raw Score	16.2	(12.40)	20	18.1	(11.86)	20	.16	.61
PEST - Percentile Rank	13.8	(26.94)	20	13.0	(22.03)	20	-.03	.92
* PLS - Auditory Comprehension Raw Score	27.0	(5.23)	20	28.5	(5.42)	20	.28	.38
PLS Auditory Comprehension (Age Equivalent in Months)	52.5	(7.85)	20	54.8	(8.14)	20	.28	.38
* PLS Verbal Ability Raw Score	22.0	(7.33)	20	24.7	(7.04)	20	.38	.24
PLS Verbal Ability (Age)	45.0	(11.00)	20	49.1	(10.56)	20	.38	.24
☆ PLS - Language (Age)	48.8	(8.86)	20	51.9	(8.99)	20	.35	.27
∞ BDI								
Personal-Social DQ	76.2	(12.60)	20	76.2	(12.90)	20	.005	.99
Adaptive Behavior DQ	90.9	(14.60)	20	88.1	(13.40)	20	-.20	.53
Gross Motor DQ	99.7	(19.20)	20	102.0	(21.60)	20	.11	.73
Fine Motor DQ	93.5	(10.30)	20	90.5	(9.00)	20	-.31	.34
Motor Total DQ	95.5	(12.10)	20	94.4	(11.90)	20	-.09	.79
Receptive Communication DQ	84.8	(17.10)	20	79.8	(14.60)	20	-.32	.33
Expressive Communication DQ	77.0	(18.10)	20	71.6	(17.40)	20	-.30	.34
Communication Total DQ	79.6	(15.30)	20	74.5	(13.30)	20	-.36	.27
Cognitive Total DQ	93.5	(10.40)	20	89.5	(11.20)	20	-.37	.25
BDI Total DQ	84.6	(9.30)	20	83.1	(11.80)	20	-.15	.65

* Raw Score is a sum of the total correct responses.

☆ Language age computed as follows Auditory Com. Age + Verbal Ability Age/2.

∞ Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing.

[Δ] $$ES = \frac{\text{Home-based adj. } \bar{X} - \text{center-based adj. } \bar{x}}{\text{Pooled SD}}$$

these subjects experienced severe speech delays and were performing approximately in the fourth percentile. Additionally, results on the PEST, which assesses imitative syntax ability, indicated that the children in each group were performing at approximately the 13th percentile.

In light of the performance levels indicated on the BDI, the Goldman-Fristoe, and the PEST, it appeared that the Preschool Language Scale (PLS) provided conflicting data on the level of functioning of the children in the study, because their scores tended to be quite high, with age equivalent scores higher than their actual chronological age. It should be noted, however, that the PLS has been cited for producing such inappropriately high age equivalents (see McLoughlin & Gullo, 1984, p. 146) and that the purpose of the use of the PLS in this study was to provide a measure that, although normed high, is commonly used among many practitioners. Since the PLS is commonly used, the data from the PLS should assist many practitioners in determining the comparability of this sample with children they serve.

Family functioning. The results of the pretest indicated that the treatment groups were not as comparable with respect to family functioning variables as they were with respect to child functioning variables. As can be noted in Table 18.5, parents in the home-based group indicated statistically significantly higher levels of stress on the PSI and the FILE than did the parents in the center-based group. On the PSI, a score above the 80th percentile is considered unusually high stress, while a score below the 15th percentile is considered unusually low stress. Interestingly, while the parents in the center-based group scored significantly lower than parents in the home-based group, both groups were in the normal stress range (center-based parents scoring at the 35th percentile, while home-based parents scored at the 70th percentile). This difference is particularly important to note since it might be expected that parents in the home-based program would experience added stress once

Table 18.5
Comparability on Pretest Family Functioning Measures for the Project PITCH Study

Variable	Center-Based Child Centered				Home-Based Parent Centered				Effect Size Δ	P Value
	$\bar{X}$	(SD)	%**	n	$\bar{X}$	(SD)	%**	n		
Age in months at time of pretest	46.2	(5.32)		20	48.0	(6.47)		20	.31	.34
Parent Stress Index										
Other Related (range 54 to 270)	111.84	(17.40)	35	19	133.90	(25.55)	72	20	1.02	.003
Child (range 50 to 235)	100.65	(15.29)	57	20	105.70	(17.10)	65	20	.31	.33
TOTAL (range 101 to 505)	211.68	(26.78)	38	19	239.60	(35.84)	71	20	.89	.009
☆Family Support Scale Total										
Mother	27.35	(8.43)	47	20	27.60	(11.18)	50	20	.03	.94
☆Family Resources Scale Total										
Mother	124.35	(16.27)	61	20	117.95	(18.62)	48	20	-.37	.25
* FACES Raw Score - Perceived										
Adaptability (range 0 to 24)	3.15	(3.24)		20	5.70	(4.17)		20	-.69	.04
Cohesion (range 0 to 30)	13.55	(7.90)		20	9.65	(7.05)		20	.52	.11
TOTAL (range 0 to 54)	16.70	(8.20)		20	15.35	(8.65)		20	.16	.62
FILE Total Score	8.95	(6.50)	47	20	12.60	(7.40)	29	20	.53	.11

* Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported on the table indicate the distance from the ideal score in raw score units. A score of 0 is best. Positive ESs indicate a negative significance.

☆ Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated in the family as being available. Higher scores are considered better. Percentiles for the FSS were computed based on 643 mothers across the EIRI sites while percentiles for the FRS were based on 621 cases at the EIRI sites.

** Values in this column are percentiles.

$$\Delta \quad \text{ES} = \frac{\text{Home-based adj. } \bar{x} - \text{center-based adj. } \bar{x}}{\text{Pooled SD}}$$

they were taught to work with their child. Results of the FILE suggested a similar difference between the groups, again indicating, though, that both groups were in the midrange on stress. Therefore, of the two groups, the parents assigned to the home-based group may have been less able to adapt to an increase in their stress level as a consequence of providing services to their child. Based on these analyses, these variables were identified as possible covariates for posttest analyses.

Statistically significant differences were found on the Adaptability and Cohesion Subscales of the FACES. Interestingly, the home-based group's adaptation score was significantly less healthy than the center-based adaptation score, while the center-based cohesion score was significantly less healthy than the home-based cohesion score.

The groups were not significantly different with respect to family support and family resources. The results of the Family Support Scale (FSS) indicated that the parents in both groups were receiving approximately 38% of the support potentially available. It should be noted that the FSS has not been normed and that, consequently, it is not possible to determine what level of support is "normal." Nevertheless, each group's parents were receiving comparable support. The results of the Family Resource Scale (FRS) indicated no significant differences between groups. Out of a total of 150 possible points, mothers scored 83% and 79% adequacy in the center- and home-based groups, respectively.

Comparability of Groups at Posttest

The following section reports the results of the posttest. First, comparisons between the two interventions are made pertaining to dependent measures of child functioning, specifically with respect to speech, language, and general developmental abilities. Second, the two intervention groups are compared on measures of family functioning. Third, the cost and effects of the interventions are presented. Fourth, the results of analyses comparing the effects of the interventions on different age of children, different levels of mother education, and different levels of mother involvement are reported. It should be noted that on each table presenting the results of analyses of covariance, cost data are also shown for each program so that the relationship between the costs and effects on each measure are clear.

Measures of Child Functioning

The first research question was: To what extent do children who are provided direct therapy from their parents make developmental gains comparable to those made by children provided traditional therapy directly from a speech pathologist?

Speech. Table 18.6 displays the results of the analysis of covariance on the posttest speech and language measures between the two intervention groups. As can be seen, children in the home-based group performed comparably in speech production to children in the center-based group. Figures 18.1 and 18.2 compare the articulation gains of the two groups on the Goldman-Fristoe, Sounds-In-Words Subtest. In this case, not only did the children in the home-based group perform at least as well as those in the center-based program, the home-based children performed significantly better ($p = .06$). It is evident in Figure 18.1 that children in the home-based group performed significantly better, with an improvement of a mean of 22 errors (the difference between pre- and posttests) compared with a mean improvement of 13 errors (again the pre-post difference) made by the center-based group ($p < .09$). Corresponding to these improvements, Figure 18.2 shows the increase in percentile ranks of the two groups as a consequence of the corrected phonemes.

Language. Table 18.6 shows that there were no statistically significant differences between the two groups on the Auditory Comprehension Subscale and the total scores of the Preschool Language Scale, indicating that children who were provided therapy by their mothers made gains comparable to those made by the children in the other group. Additionally, and as is apparent in Figure 18.3, the home-based group performed significantly higher than the center-based group on the verbal

Table 18.6

Posttest Comparison of Groups on the Speech and Language Measures for the Project PITCH Study

		Center-Based Child Centered				Home-Based Parent Centered				ANCOVA		
Variable	Covariate➡	$\overline{X}$	(SD)	Adj $\overline{X}$	n	$\overline{X}$	(SD)	Adj $\overline{X}$	n	F	ES$^{\Delta}$	P Value
Age of Child in Months at Posttest		53.3	(5.63)		20	54.8	(6.85)		20	.76	.24	.45
Goldman-Fristoe--Sounds in Words--# of errors	PSI-Total FACES-Adapt	24.1	(12.52)	26.99	20	20.9	(13.07)	17.97	20	3.75	.70	.06
Goldman-Fristoe--Sounds in Words--Percentile Rank	PSI-Total FACES-Adapt	21.4	(22.89)	16.46	20	27.7	(26.84)	32.62	20	3.01	.65	.09
* PLS - Auditory Comprehension Raw Score	BDI-Comm-Total	33.0	(5.32)	33.25	20	33.6	(5.20)	33.82	20	.26	.11	.60
PLS - Auditory Comprehension (Age Equivalent in Months)	BDI-Comm-Total	61.9	(8.00)	61.45	20	62.3	(7.80)	62.73	20	.27	.16	.60
* PLS Verbal Ability Raw Score	BDI-Comm-Total	31.1	(5.75)	30.51	20	33.6	(6.48)	34.14	20	4.39	.59	.04
PLS Verbal Ability (Age)	BDI-Comm-Total	58.6	(8.63)	57.76	20	62.4	(9.71)	63.21	20	4.39	.60	.04
☆PLS Language (Age)	BDI-Comm-Total	60.2	(7.69)	59.64	20	61.9	(8.25)	62.41	20	1.34	.35	.25
** TACL-R												
Word Classes & Relations Raw Score	BDI-Cog-Age	28.0	(6.63)	27.60	20	30.2	(4.38)	30.50	20	2.83	.53	.10
Word Classes & Relations Age Equivalent	BDI-Cog-Age	58.7	(12.22)	58.29	20	62.7	(10.80)	63.11	20	1.73	.42	.20
*Grammatical Morphenes Raw Score	BDI-Cog-Age	21.8	(7.45)	21.12	20	22.3	(6.93)	22.93	20	.81	.25	.38
Grammatical Morphenes Age Equivalent	BDI-Cog-Age	60.2	(14.47)	58.92	20	60.9	(14.36)	62.16	20	.61		.44
*Elaborated Sentences Raw Score	BDI-Cog-Age	15.3	(6.53)	14.71	20	17.2	(5.68)	17.69	20	2.84	.45	.10
Elaborated Sentences Age Equivalent	BDI-Cog-Age	58.1	(14.04)	56.95	20	61.7	(12.13)	62.78	20	2.42	.49	.13
*TACL Total Raw Score	BDI-Cog-Age	65.0	(17.89)	63.44	20	69.6	(13.75)	71.11	20	3.01	.45	.09
TACL Total Score Age Equivalent	BID-Cog-Age	58.5	(12.31)	57.63	20	61.0	(9.37)	61.82	20	1.69	.39	.20
∞ Costs per child												
Program			$2,093				$2,287					
Parents			$ 514				$ 686					
Total			$2,607				$2,973					

☆Language age is computed as follows: Auditory Comprehension Age + Verbal Ability Age/2.

∞ Costs are taken from Table 18.3 which is more detailed.

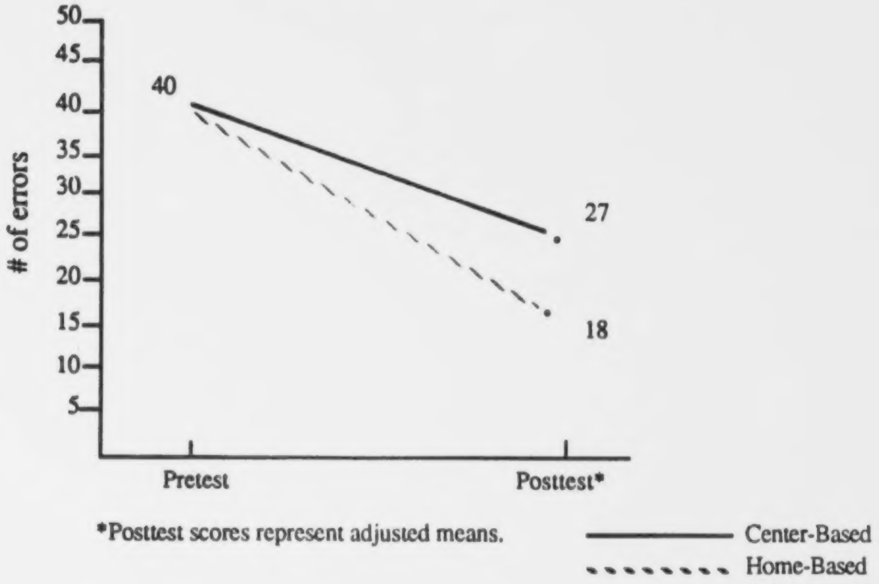
* Raw score is a sum of the total correct responses.

**Age equivalent scores on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

➡ All covariates from the BDI were in the form of the computed DQ's while covariates from the PSI and FACES were raw scores.

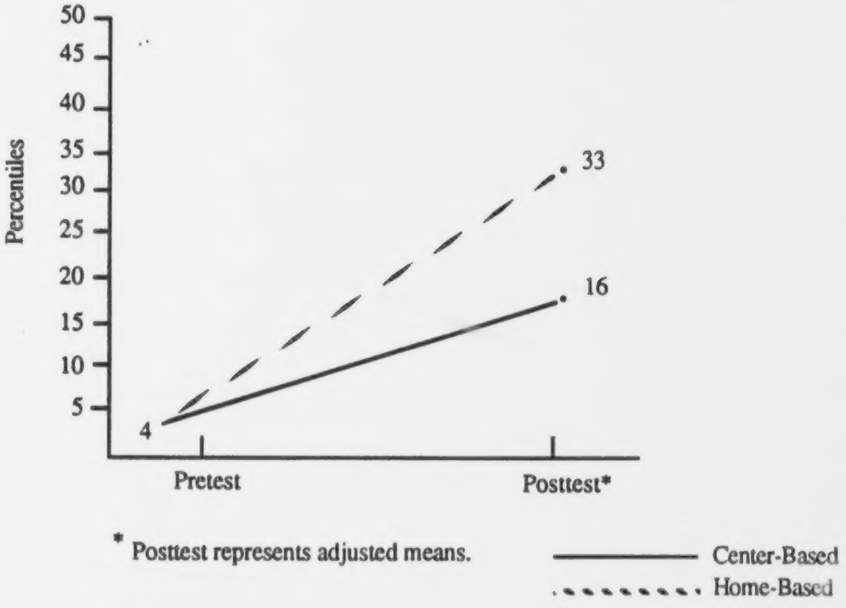
$$^{\Delta}ES = \frac{\text{Home-based adj. } \bar{X} - \text{center-based adj. } \bar{X}}{\text{Pooled SD}}$$

Figure 18.1. Number of Errors on Goldman-Fristoe Test of Articulation, Pretest-Posttest.



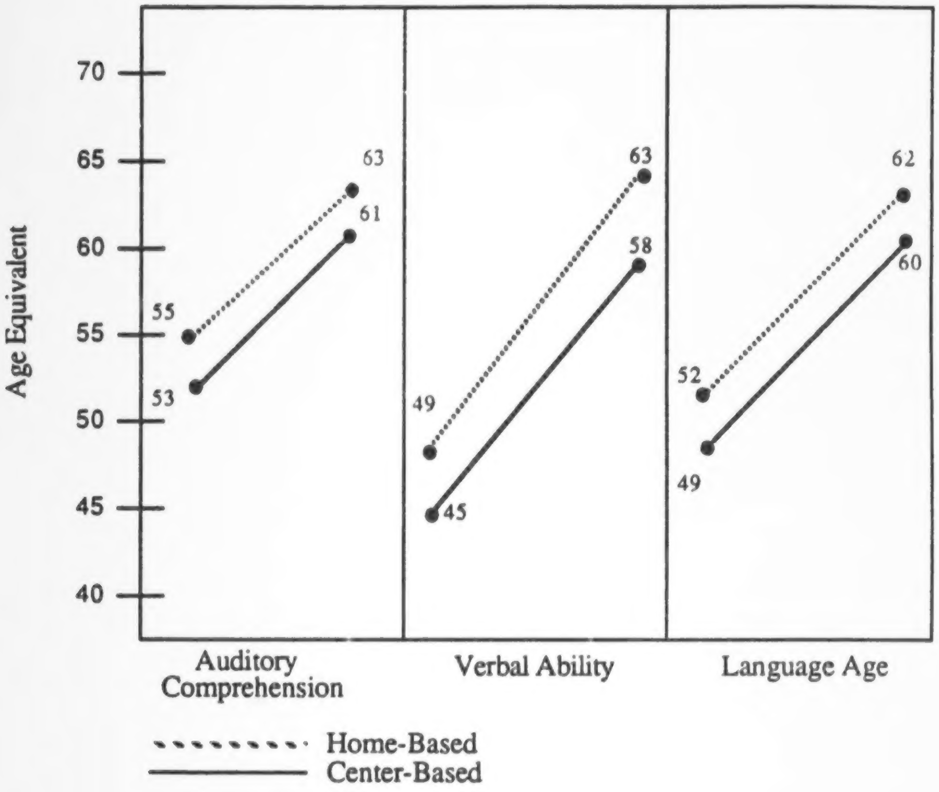
*Posttest scores represent adjusted means.

Figure 18.2. Percentile Ranks on Goldman-Fristoe Test of Articulation, Pretest-Posttest.



* Posttest represents adjusted means.

Figure 18.3. Preschool Language Scale Pretest-Posttest Comparisons.



$\overline{X}$ Age of Children in Months at Pretest: Center =46.2
Home =48.0

$\overline{X}$ Age of Children in Months at Posttest: Home =53.3
Center =54.8

ability subscale of the PLS (p < .04). With respect to receptive communication skills, the home-based group again performed at least as well as the center-based group on the TACL-R. Table 18.6 indicates that, although not statistically significant, the home-based group scored approximately one-half of a standard deviation higher than the center-based group on the Word Classes and Relations Subscale (raw score, ES = .53), the Elaborated Sentences Subscale (age equivalent, ES = .48), and the total TACL-R score (raw score, ES = .48).

General development. In the area of general development, children in both interventions made substantial overall progress as measured by the Battelle (see Figure 18.4). As can be seen, the home-based group more consistently made gains while the center-based group showed some losses. Table 18.7 shows the results of the posttest analysis of covariance between the two groups on the Battelle and indicates that, once again, the home-based group demonstrated at least comparable developmental abilities with the center-based group. While no significant differences were found on the total Battelle score, the home-based group performed significantly better than the center-based group on the motor ($p < .003$) and cognitive subscales ($p < .10$).

Family Functioning Outcomes

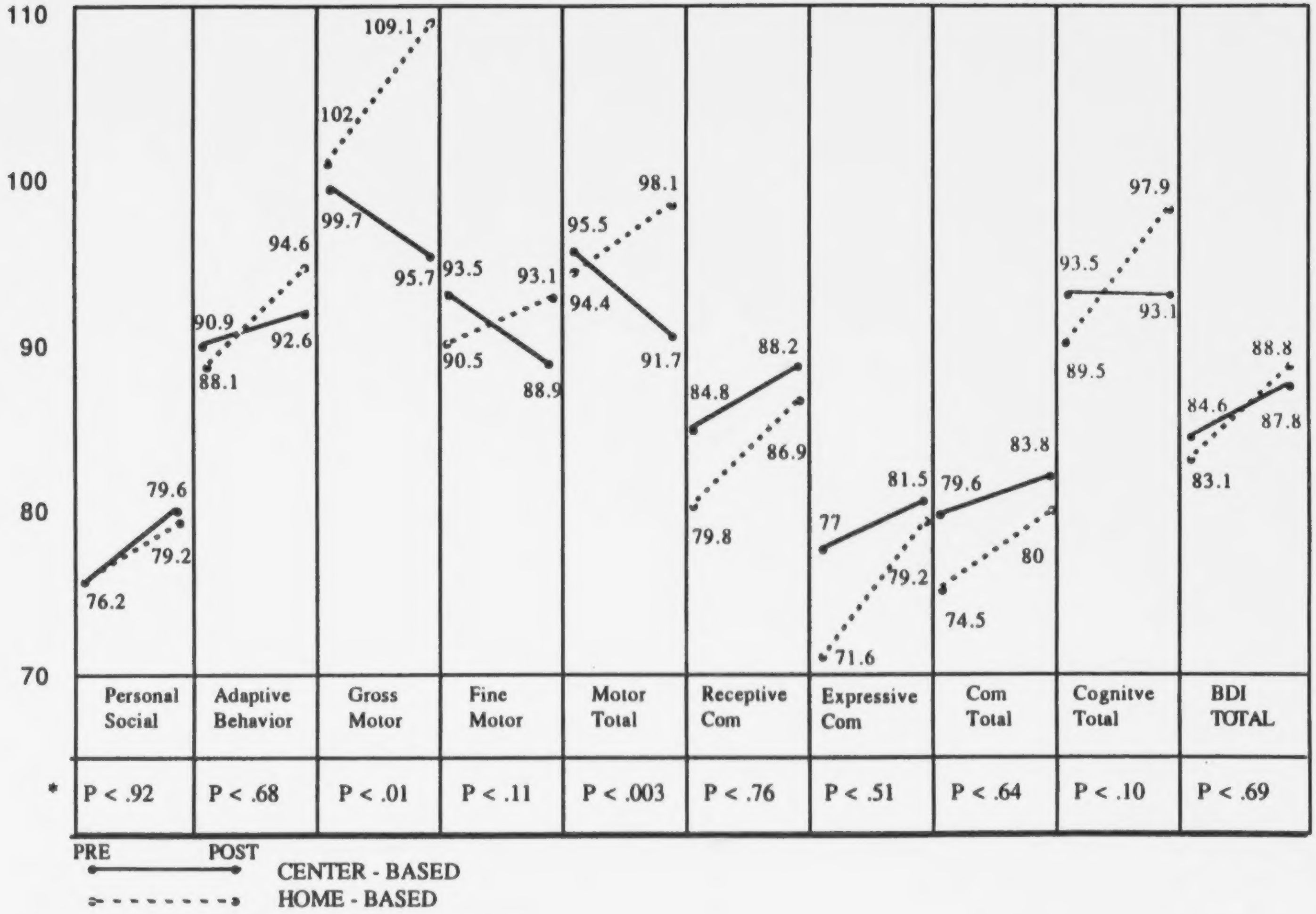
The second research question addressed by the study was: To what extent are the families of the children in the two interventions comparably influenced by the respective interventions? Table 18.8 presents the results of the Parenting Stress Index that indicated no significant differences between the groups ($p < .55$). Both groups, however, continued to be within the normal stress range, indicating that neither intervention led to an increase in stress.

No statistically significant differences were found between groups on either the Adaptability or Cohesion subscales of the FACES ($p < .63$ and $p < .62$, respectively). While the groups appear to have remained at approximately the same level on the Adaptability subscale, both groups scored somewhat more healthy on the Cohesion subscale, and neither group was significantly more healthy than the other.

Parent Satisfaction

As is shown in Table 18.9, the results of the Parent Satisfaction Questionnaire indicated that parents in both groups were "very satisfied" with the service they received. Parents in the center-based group were the only ones who expressed any negative feelings about their child's program. Significant differences between the

. Figure 18.4 Battelle Developmental Pretest-Posttest Comparisons $^{\Delta}$



*P Values represent posttest ancova comparisons

$^{\Delta}$Means represent adjusted means on the posttest

Table 18.7

Posttest Comparison of Groups on the Battelle for the Project PITCH Study

		Center-Based Child Centered				Home-Based Parent Centered				ANCOVA		
Variable	Covariate †	$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	F	ES$^{\Delta}$	P Value
Age of Child in Months at Posttest		53.3	(5.63)		20	54.8	(6.85)		20	.76	.24	.45
BDI *												
Personal-Social DQ	**BDI-Recept BDI-Total**	80.6	(15.40)	79.6	20	78.1	(13.60)	79.2	20	.01	-.03	.92
Adaptive Behavior DQ	**PSI-Total BDI-Adpt-Beh**	97.3	(13.00)	96.2	20	93.5	(12.60)	94.6	20	.18	-.13	.68
Gross Motor	**FACES-Cohes BDI-Mtr-Tot**	97.1	(19.50)	95.7	20	107.6	(17.20)	109.1	20	7.22	.73	.01
Fine Motor DQ	**BDI-Total BDI-Fine**	89.7	(10.90)	88.9	20	92.4	(7.50)	93.1	20	2.66	.46	.11
Motor Total DQ	**BDI-Motor BDI-Total**	92.2	(9.90)	91.7	20	97.6	(9.00)	98.1	20	10.23	.68	.003
Receptive Comm. DQ	**BDI-Recept BDI-Cognitive**	90.3	(19.50)	88.2	20	84.8	(14.80)	86.9	20	.09	-.08	.76
Expressive Comm. DQ	**BDI-PSA BDI-Com-Tot**	82.5	(16.20)	81.5	20	78.2	(11.90)	79.2	20	.43	-.16	.51
Communication Total DQ	**FACES-Cohes BDI-Com-Tot**	85.1	(16.40)	83.8	20	80.7	(11.00)	82.0	20	.22	-.13	.64
Cognitive Total DQ	**FACES-Cohes BDI-Cognitive**	94.8	(13.40)	93.1	20	96.1	(10.70)	97.9	20	2.82	.40	.10
BDI Total DQ	**BDI-Total BDI-Com-Tot**	88.6	(11.50)	87.8	20	88.0	(8.80)	88.8	20	.16	.10	.69
☆Costs per child												
Program		$2,093				$2,287						
Parents		$ 514				$ 686						
Total		$2,607				$2,973						

* **Developmental Quotient (DQ) were calculated by** dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the **chronological age at time of testing.**

☆**Costs were taken from Table 18.3 which is more** detailed.

† **All covariates from the BDI were in the form** of the computed DQ's while covariates from the FACES and PSI were the raw scores.

$$^{\Delta}\text{ES} = \frac{\text{Home-based adj. } \bar{X} - \text{center-based adj. } \bar{X}}{\text{Pooled SD}}$$

Table 18.8

Posttest Comparison of Groups on the Family Functioning Measure for the Project PITCH Study

		Center-Based Child Centered					Home-Based Parent Centered					ANCOVA		
Variable	Covariate	$\bar{X}$	(SD)	Adj $\bar{X}$	%**	n	$\bar{X}$	(SD)	Adj $\bar{X}$	%**	n	F	ES Δ	P Value
Age in Months at Time of Posttest		53.3	(5.63)			20	54.8	(6.85)			20	.76	.24	.45
Parent Stress Index														
Other related (range 54 - 270)	PSI-Total	110.8	(23.27)	117.9	43	20	133.0	(25.41)	125.9	60	20	1.64	.33	.21
Child (range 50 to 250)	PSI-Tot	98.3	(18.06)	103.8	64	20	110.2	(18.37)	104.6	65	20	.03	.04	.87
TOTAL (range 101 to 505)	PSI total FILE Total	209.0	(35.41)	223.1	53	20	243.2	(39.43)	229.1	61	20	.37	.16	.55
☆Family Support Scale Total														
Mother	FACES-Cohes Faces-Adapt	31.0	(9.40)	29.9	57	20	29.0	(9.92)	30.1	57	20	.002	.02	.96
☆Family Resources Scale Total														
Mother	FACES-Cohes FACES-Adapt	122.4	(18.27)	120.9	54	20	120.2	(18.3)	121.6	55	20	.015	.04	.90
***FACES Raw Score - Perceived**														
Adaptability (range 0-24)	FACES-Adapt	4.0	(3.10)	4.4		20	5.6	(4.93)	5.1		20	.24	.16	.63
Cohesion (range 0-30)	FACES-Cohes	10.8	(7.82)	9.9		20	7.9	(8.48)	8.7		20	.25	-.15	.62
TOTAL (range 0-54)	FACES-Tot	14.7	(8.94)	14.4		20	13.4	(10.70)	13.7		20	.06	-.08	.81
FILE Total Score	PSI-Total FILE-Total	8.3	(6.01)	9.6	40	20	9.5	(5.26)	8.2	55	20	.93	-.26	.34
∞ Costs Per Child														
Program		$2,093					$2,287							
Parents		$ 514					$ 686							
Total		$2,607					$2,973							

* **Scores for each subscale of the FACES are derived** from the "ideal" score reported in the technical manual. Scores reported on the table indicate the **distance from the ideal score in raw score units.** A score of 0 is best. Positive ESs indicate a negative significance.

☆**Analyses for the FSS and FRS are based on raw** scores indicating the number of supports or resources indicated in the family as being available. **Higher scores are considered better. Percentiles** for the FSS were computed based on 643 mothers across the EIRI sites while percentiles for the **FRS were based on 621 cases at the EIRI sites.**

****Values in this column are percentiles.**

∞**Costs were taken from Table 18.3,** which is more detailed.

$$\Delta\ ES = \frac{\text{Home-based adj. } \bar{X} - \text{center-based adj. } \bar{X}}{\text{Pooled SD}}$$

Table 18.9

Comparability of Groups on Posttest Parent Satisfaction Questionnaire for the Project PITCH Study

Variable	Center-Based Child Centered			Home-Based Parent Centered			ANCOVA	
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n	Effect$^{\Delta}$ Size	P Value
*Satisfaction with Therapist	3.75	(.55)	20	3.95	(.23)	20	.51	.14
*Ease of Communication with Therapist	3.60	(.59)	20	3.85	(.37)	20	.52	.20
*Satisfaction with Goals and Activities	3.55	(.69)	20	3.90	(.31)	20	.70	.04
*Opportunity for Parent Participation	2.65	(1.04)	20	3.85	(.67)	20	1.40	.000
*Satisfaction with Range of Services	3.45	(.76)	20	3.55	(.51)	20	.16	.63
*Satisfaction with Child's Progress	3.55	(.83)	20	3.55	(.51)	20	0	1.00
*Satisfaction with PITCH Program	3.60	(.82)	20	3.95	(.22)	20	.67	.07
∞ Costs per child								
Program	$2,093			$2,287				
Parents	$ 514			$ 686				
Total	$2,607			$2,973				

*Analysis on the variables were based on ratings on a 4-point scale as follows: (4=excellent; 3=good; 2=fair; 1=poor).

∞ Costs were taken from Table 18.3, which is more detailed.

$$^{\Delta}\ \mathrm{ES} = \frac{\text{Home-based adj. } \bar{x} - \text{center-based adj. } \bar{x}}{\text{Pooled SD}}$$

groups were found on three of the Parent Satisfaction items; Satisfaction with Goals (p < .04), Opportunity for Parent Participation (p < .000), and Satisfaction with PITCH program (p < .07). In each of these cases, the center-based parents expressed lower satisfaction levels, although they remained "moderately" to "very satisfied" with their program.

Additionally, parents' perceptions of their child's improvement in speech and language as a result of the therapy and improvement they may have noticed in their relationships with the child as a result of the therapy were obtained. Table 18.10 shows that both groups were comparably satisfied with their respective interventions. When parents were asked to state their preference for center-based or home-based services, however, a clear distinction appeared. Table 18.11 shows that 70% of the 40 parents participating in the study would prefer home-based services. The

Table 18.10

Posttest Comparability of Groups on Parent Attitudes for Project Pitch

	Center-Based Child Centered	Home-Based Parent Centered
Parents perceived positive changes in child's behavior as a consequence of child's training	85% (17/20)	90% (18/20)
Parents perceived improvement in parent-child relationship as a consequence of child's training.	70% (14/20)	80% (16/20)
Parents would choose to have child in this service.	55% (11/20)	95% (19/20)

Table 18.11

Parents' Program Preference

	Preferred Center-based	Preferred Home-based
Center-based parents	55% (11)	45% (9)
Home-based parents	5% (1)	95% (19)
Total	12 (30%)	28 (70%)= 40 (100%)

advantages and disadvantages parents reported for each of the types of interventions were as follows:

Advantages of home-based:

- Parent learning
- Teaching in home environment
- Parent-child relationship
- Daily teaching

Disadvantages of home-based:

- Little time/interruptions
- Hard to work with own child
- Lack of socialization

Advantages of center-based:

- Regular schedule
- Child works with professional
- Socialization

Disadvantages of center-based:

- Driving/baby sitters
- No parent-child interaction
- No on-going training

Description of Family Functioning

Also at posttest time, families in both groups completed the FILE, the FRS, and the FSS. While these measures were not used as dependent variables, they provide additional description of the families at posttest time. As can be seen in Table 18.8, no significant differences were found at posttest time between the two groups on the FILE, FRS, or the FSS.

Comparisons of Programs Costs and Effects

Each of the effects Tables, Tables 18.6 - 18.9, also present the costs per child of each program, both with and without parent's volunteer time taken into account. As can be seen, the difference between actual program costs is negligible, as is the difference between costs when parent's time is included. This is especially true when noting that the salary difference of the therapists is arbitrary and does not reflect a necessary "ingredients" of the respective programs. The minimal cost difference in parent time is due to the fact that parents in the center-based program were required to transport their child making the time they spent for the program similar to that spent by home-based parents. Therefore, any significant effects noted in Tables 18.6 - 18.9 can reasonably be interpreted to have been at a negligible cost to the program as well as slight, if not also, negligible cost to society (costs including parent time).

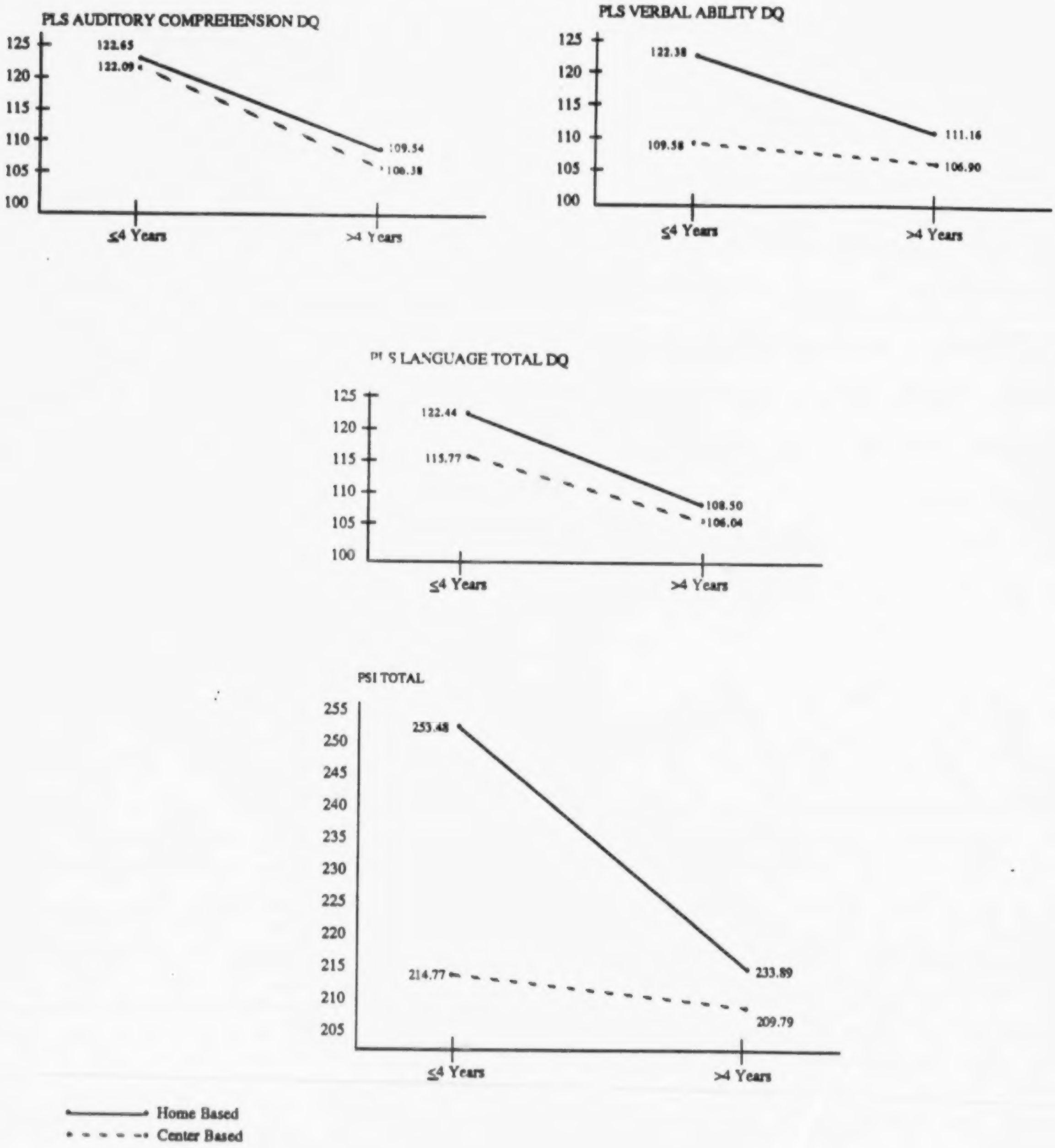
Subgroup Analyses

Three subgroup ANCOVAs were conducted: (1) comparison of treatments by the age of children, (2) comparison of treatment by level of mother's education, and (3) comparison of treatments by level of parent involvement.

Effects by age. One of the research questions addressed by this study was: To what extent do 3-year-olds perform comparably to 4-year-olds in each of the settings, or to what extent does one setting appear more beneficial to a specific age group?

An ANCOVA was computed examining the effects by age of child. On those variables where significant differences were found, t-tests were computed using ANCOVA adjusted means to determine between which subgroups a significant difference existed. The results indicated significant differences due to age in only several cases on the PLS. These are shown in Figure 18.5. Overall, these differences indicated that 3-year-olds consistently scored higher than 4-year-olds. Specifically, home-based 3-year-olds scored higher than center-based 4-year-olds on

Figure 18.5. Subgroup analyses of effect by age of child and treatment*



*T-Test analyses were conducted using adjusted means.

the PLS verbal ability DQ, [t(15) = 2.46, p = .05], the PLS Auditory Comprehension DQ [t(15) = 3.37, p = .01], and the PLS total DQ [t(15) = 3.25, p = .01]. Additionally, this same group of home-based 3-year-olds scored higher than the home-based 4-year-olds on the PLS Auditory Comprehension DQ [t(18) = 2.60, p = .05] and the PLS total DQ [t(18) = 2.75, p = .05]. On the PLS Auditory Comprehension DQ, the center-based 3-year-olds performed better than the center-based 4-year-olds [t(18) = 2.75, p = .05] and the home-based 4-year-olds [t(20) = 2.30, p = .05].

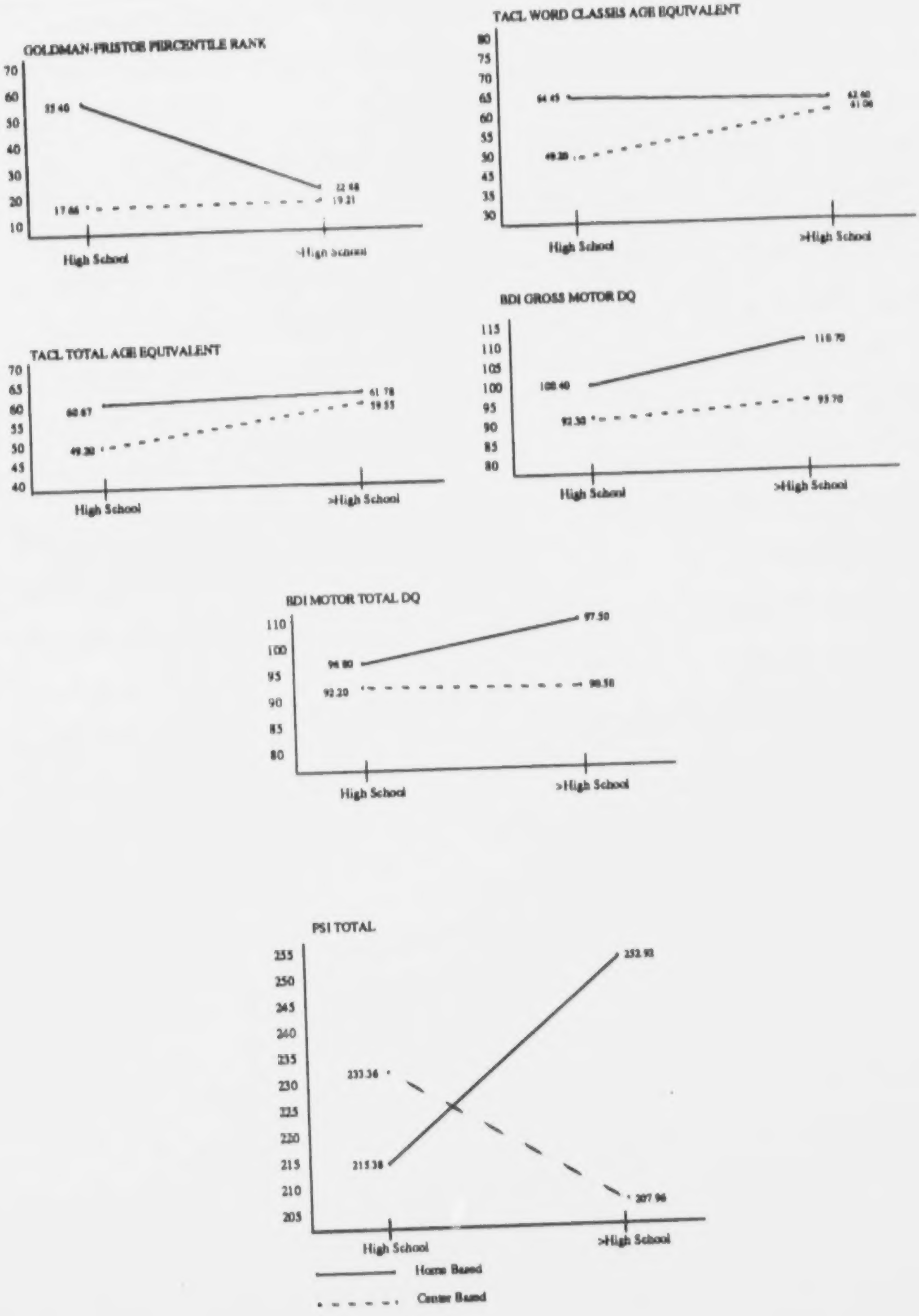
While the 3-year-olds, especially those in the home-based program, appear to have benefitted more than the 4-year-olds (see Figure 18.5), results of the PSI indicated that the home-based parents of 3-year-olds were more stressed than the center-based 3-year-olds [t(19) = 3.98, p = .005] and the center-based 4-year-olds [t(15) = 2.52, p = .025].

Effects by mother education. Another research question addressed by this study was: To what extent do children of mothers with only a high school education perform comparably to children whose mothers have more than a high school education?

An ANCOVA was computed in order to examine the effects by level of mother education on each of the outcome variables. On those variables where significant differences were found, t-tests were computed using adjusted means to determine between which subgroups a significant difference existed (see Figure 18.6). The results indicate that, in most cases, mothers with a high school education performed at least as well as mothers with higher education, if not better. Specifically, home-based children of mothers who received no higher than a high school education performed significantly higher on the Goldman-Fristoe than home-based children of mothers who had received a higher education [t(18) = 2.90, p = .005] and center-based children of mothers who had received a higher education [t(18) = 2.67, p = .01].

When comparing the performance of only the children of mothers with no more than a high school education in each of the treatments, it was found that the home-based

Figure 18.6. Subgroup analyses of effect by level of mother's education and treatment



children performed consistently better; thus, reiterating findings that examined effects by treatment. Specifically, the home-based children of mothers who received only a high school education scored higher than the center-based children of mothers with the same education levels on the Goldman-Fristoe [t(8) = 1.94, p = .05], the TACL-R Word Classes Subtest [t(8) = 2.93, p = .01], and the TACL-R Total [t(8) = 3.27, p = .05].

Similarly, when comparing the performance of only the children of mothers with more than a high school education in each of the treatments, it is evident again that the home-based children consistently performed better than center-based children. Specifically, although the home-based children of mothers with a higher education performed comparably on each of the outcome measures with center-based children of mothers with the same education levels, home-based children of mothers with a higher education performed better than the center-based children of mothers with only a high school education on the TACL-R Word Classes Subtest [t(18) = 2.66, p = .01], the TACL-R Total Score [t(18) = 1.94, p = .05], and the BDI Gross Motor Subscale [t(18) = 1.86, p = .05]. These home-based mothers with a higher education, however, demonstrated higher stress than each of the other mother education-by-treatment subgroups: they were more stressed than the center-based mothers with a higher education [t(28) = 3.68, p = .005], the home-based mothers with only a high school education [t(18) = 1.92, p = .05], and the center-based mothers with only a high school education [t(18) = 1.43, p = .10]. Additionally, center-based children of mothers with a higher education performed significantly better than center-based children of mothers with a high school education on the TACL-R Word Classes Subtest [t(18) = 2.55, p = .01].

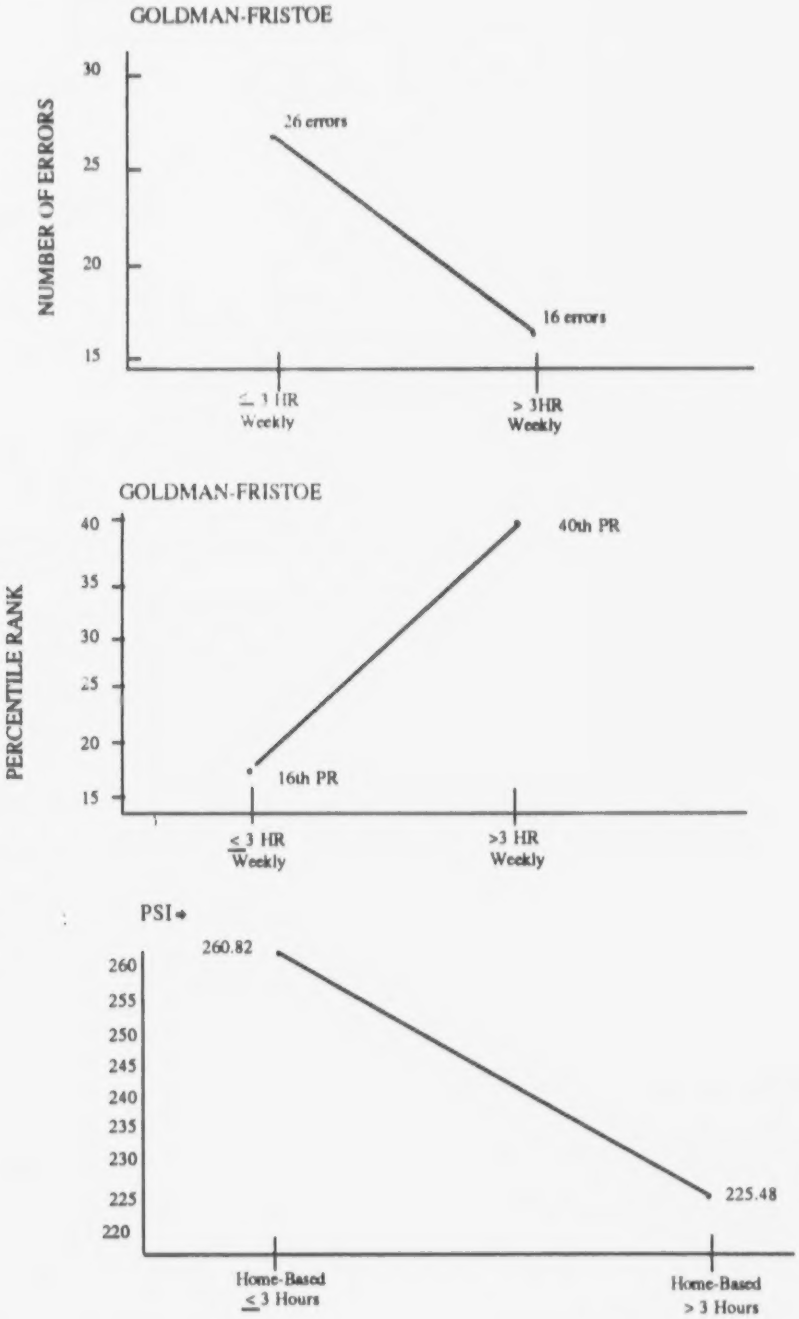
Effects by parent involvement. The final question addressed here is: To what extent do children whose mothers spend less than 3 hours per week working on speech and language related activities perform comparably with children whose mothers spend more than 3 hours per week working with them?

Again, an ANCOVA was computed in order to compare the two levels of parent involvement in the home-based group. The findings show that in most cases children performed comparably no matter how much time mothers spent with them. However, one important difference was found on the Goldman-Fristoe (see Figure 18.7). Children of mothers who spent more than 3 hours per week made significantly less errors on the Goldman-Fristoe [t(18) = 1.84, $\underline{p}$ = .05] and were percentile ranked significantly higher on the Goldman-Fristoe [t(18) = 2.19, $\underline{p}$ = .025]. These mothers who spent less than 3 hours per week, however, demonstrated significantly higher stress on the PSI than those who spent less than 3 hours per week [t(18) = 2.07, $\underline{p}$ = .05].

Conclusions

The most important conclusion of this study is that with appropriate training and assistance, mothers provided therapy for speech correction, language acquisition, and general development to their severely speech disordered children as effectively as did the professionally trained therapist. Furthermore, there is some indication that children provided therapy by their mothers actually performed better in some areas than those who received therapy from the professional therapist; home-based children performed slightly better in articulation and general verbal abilities than the center-based children. The home-based children also demonstrated some additional abilities in the motor and cognitive domains of the Battelle that the center-based children did not demonstrate. This difference is possibly due to mothers spending time incidentally working with the child and generalizing her training to other areas where the child showed weaknesses. It should be stressed, however, that the most important and remarkable conclusion of the study is that mothers were able to perform as well as a professional therapist. The differences noted in these other areas are

Figure 18.7. Subgroup analysis of effect by degree of parent involvement



*Analyses were performed only on the Home-based group.

*T-Test analysis was conducted on adjusted means.

important trends that should be examined more closely before conclusions are drawn about any advantages a parent-centered approach has over a child-centered approach.

Some educators and parents believe that redefining the parents' roles to include becoming teachers for their children puts undo strain on the parent-child relationship. The argument is, "It's demanding enough to be parents; don't expect them to be teachers too!" It must be acknowledged that some parents with speech disordered children would not choose or welcome the opportunity of being trained as a speech paraprofessional for their children, and, in some cases, the responsibility of this added task would result in excessive stress, although this study did not find statistically significantly higher levels of stress among parents in the home-based group. Overall, the findings of this study support controversial claims made by experts as early as 1948 (Lillywhite) that mothers should not be excluded from the speech training of their delayed and handicapped children, and that they can, in fact, be effective as speech therapists to their children (Tufts & Holliday, 1959; Sommers, 1959; Sommers et al., 1962; Sommers et al., 1964). Further, these findings are especially significant considering the recent congressional mandate (P.L. 99-457) requiring parents to be included in the training of their child. Thus, this study has shown that parents need not play only superficial roles in their child's training and, instead, can be given major responsibilities in meeting their child's educational needs.

When considering the program costs of using a professional therapist to provide direct therapy to the child or to provide training to parents, there is a negligible difference between the two approaches. In this regard, it would appear that the home-based, parent-centered program is the cost-effective program due to the trend evidenced in the home-based group performing slightly better in some areas. However, when accounting for parents' time in each program, it is evident that the parent-centered program is somewhat more costly, and that one can no longer draw the unequivocal conclusion that the parent-centered program is cost-effective. The counter argument would be that by training parents, the school invests in broadening the capabilities of the parents, which hopefully extends to all family members and strengthens the families' abilities to work with the handicapped child and any other children that, subsequently, may require special services (which is often the case with speech disordered children as younger siblings tend to model speech patterns of older siblings).

The question, then, is how much value is there in the additional benefits (short- and long-term) obtained by parents as therapists, and how does this compare with the additional costs to society this approach requires? This question can only be answered by those making the individual programming decisions, including parents themselves.

Results of this study suggest administrators have two viable programming options. The questions at hand are: (a) Given the same amount of a therapist's time, should the therapist work directly with the child or with the parent?; and (b) Are some parents and some children more successful in one program than in another?

The results of this study begin to shed light on this question in four main areas. First, parent preference should always be a consideration when developing a child's program. In this study, although all of the parents, both center- and home-based, were "very satisfied" with the services they received, 70% of the parents said they would prefer a home-based program in the future. While each parent noted unique advantages and disadvantages to each type of program, it was commonly expressed that parents value involvement in their child's education.

Second, this study examined the success of the 3-year-olds compared to the 4-year-olds in each of the programs. The results indicated a trend favoring the 3-year-olds in the home-based program over the 3-year-olds in the center-based program in verbal ability and a general tendency for the 3-year-olds in the home-based program to benefit more than all of the others in the two programs. However, mothers of the home-based 3-year-olds were more stressed than the other mothers in the study. These findings, once substantiated with additional research, may suggest that age be an important determinant of the most appropriate type of parent involvement to be used in a child's program and that stress be a special consideration when working with mothers of 3-year-olds.

Third, this study examined mother's educational level and its effect, if any, on the child's performance. While some might expect that less educated mothers be less effective with their children, these findings do not support this belief. Contrarily, of the children in the home-based group, there were no cases in which the children of more highly educated mothers performed significantly better than those whose mothers had received only a high school education. In fact, there were several cases in which the children of less educated mothers performed significantly better than the children of mothers with higher education in the home-based group. This may be due to the fact that the less educated mothers appeared to more seriously take the responsibility they were given to work with their child, while the mothers with higher education tended to assume they were able to work with their child without the training and suggestions provided by the therapist. Further, less educated mothers experienced lower stress, again suggesting that they may adapt well to such a role.

While these findings may suggest that we dismiss the notion that less educated mothers are ineffective as therapists, it should be noted that even the lowest levels of education of mothers in this study (all of whom had completed the 12th grade) were not as extreme as is often prevalent in other populations. Therefore, additional research should examine the question of the effect of mothers' educational levels on their ability to work effectively as therapists for their children.

Fourth, this study attempted to examine the critical variable of parent time and the challenge of measuring parent time spent with the child. One methodological conclusion that can be drawn is that it is vital that parent time measurements be triangulated so that reliability can be tested in a number of ways. Second, it was concluded that in the absence of an extensive naturalistic study on parent time, estimates of parent time collected by means used in this study were suspect.

Given the questionable nature of the time data that was collected, conclusions about the effects of variable time spent working with the child in the home-based group can be drawn only with caution. While it was possible to distinguish two groups based on the number of hours spent each week with the child, in most cases there were no significant differences between the performances of the children in each group. Nevertheless, the "more than 3-hours-per-week" group did perform significantly better than the lower time-group on articulation, yet they demonstrated lower stress. It appeared, in fact, that the children whose mothers spent less than 3 hours per week working with them performed no better than the children in the center-based group who were provided therapy by the professional therapist 1 hour a week. These results suggest that parent time committed to working with their child may be directly associated with child performance. However, additional research is vital in order to more reliably measure parent time actually spent with the child and its subsequent cost and effects.

Future Plans

Currently, language sample data are being analyzed. During the 1988-89 year, 17 of the 40 subjects (10 center-based, 7 home-based) will continue to be served in the PITCH program in the treatment to which they were assigned during this year. All 40 subjects will be posttested at the end of the year, and treatment verification activities will be repeated. A new therapist has been hired and trained to implement the two therapies and will be supervised by the same individuals responsible last year. The same measures will be used.

III. CROSS STUDY ISSUES

In addition to the results of the individual studies, there are a number of issues that can be addressed by integrating the results of two or more studies. This section of the report contains a discussion of the following issues:

1. *Intervention with Medically Fragile Infants and Young Children*. Results from the Salt Lake City, LSU, and South Carolina IVH studies, together with the anticipated results from the Phoenix Brain Trauma study and the Columbus study with chronic lung disease children, provide a wealth of information about early intervention with medically at-risk children. This section summarizes the results at this point in time across those different studies.

2. *A Preliminary Comparison of Parent-Infant Interaction Coding Systems*. In order to examine the effects of early intervention on mother-child interaction, institute personnel have videotaped more than 200 mother-child dyads at six sites. These videotapes will be scored by the developers of four widely-used scoring systems. This section reports on this process.

3. *Assessment of Family Functioning*. The importance of including assessments of family functioning in early intervention research has only been recognized recently, and a great deal of uncertainty remains about which measures to use and how to interpret those results. This section provides a rationale for the selection of family measures used in the longitudinal studies.

4. *Family Characteristics, Family Type, and Stress in Families with Handicapped Children*. Using data from over 500 families who are participating in the longitudinal studies, EIRI researchers investigated the relationships between family type, stress, and sources of support, and family demographic information. These data are reported here.

5. *Relationship of Demographic and Family Functioning Variables to Parental Involvement*. The parameters of parental involvement still constitute an important research issue. This study investigated factors related to parental involvement in their handicapped child's education.

6. *Measuring Parental Involvement*. Early Intervention services continue to place increasing emphasis on family involvement. EIRI personnel have developed several methods for measuring parental involvement. This section describes these methods and evaluates their effectiveness.

7. *Costs of Early Intervention*. We now have cost estimates of 15-20 different early intervention programs. By examining the estimates across each of our studies, we can draw conclusions about the different models of intervention cost. Since most current estimates of cost for early intervention are based on hypothetical situations, such information will be useful to policy makers, administrators, and practitioners.

8. *Technical Adequacy of the Battelle Developmental Inventory*. The Battelle Developmental Inventory (BDI) has been used as one of the basic child outcome measures in the longitudinal studies. This paper evaluates the usefulness of the BDI for making eligibility and placement decisions in special education.

Intervention with Medically Fragile Infants and Young Children

Advances in medical technology over the past 20 years have resulted in a dramatic increase in our ability to save medically fragile infants. Infants with lower and lower birthweights and with more severe medical complications are surviving at an increasing rate. At the same time that technology is enabling us to save more lives, morbidity rates for the survivors may be increasing. A substantial percentage of low birthweight (LBW) infants suffer a permanent disability (Danto, 1984), and infants who have spent considerable time in Neonatal Intensive Care Units (NICUs) make up a disproportionately large segment of the handicapped population, with estimates ranging as high as 60%.

In response to the above considerations and the recent amendments to the Education of the Handicapped Act (P.L. 99-457), non-medical intervention services for medically fragile infants are proliferating. Early intervention programs are seen as having implications for reducing the level of stress in families, reducing the incidence of abuse and neglect, and reducing the level of comprehensive services and thus the costs of services required later in an infant's life.

The importance of initiatives related to the medically fragile infant grows out of recent developments in three important areas.

- Neonatal Intensive Care Units (NICUs) and Pediatric Intensive Care Units (PICUs) have made dramatic progress over the last 20 years in reducing mortality rates among medically fragile infants and toddlers admitted to these units. However, increasing numbers of these children require continuing medical follow-up as well as developmental/educational interventions.

- Over the same period that NICUs and PICUs have made such dramatic progress in reducing mortality, there has been exponential growth in early intervention for handicapped and at-risk children. From the modest but well publicized efforts of the early 1960s, early intervention has grown into a multi-billion dollar per year enterprise which encompasses many different types of programs and provides a wide variety of services to handicapped children and families.

- In 1986, Congress passed legislation establishing Public Law 99-457. This set of amendments to the Education of the Handicapped Act (EHA)

> established an important and historical extension of Public Law 94-142 (the Education for All Handicapped Children Act). Building upon the framework of P.L. 94-142, Part H of P.L. 99-457 established a separate state grant program that provides substantial incentives for states to begin serving handicapped children under age three.

At the present time, we are seeing the combined influence of the three developments described above. As states prepare to implement the provisions of P.L. 99-457, they are recognizing that a large percentage of children to be served in 0- to 2-year-old programs will come from NICUs and PICUs. At the same time, there is a recognition that the best programs will not be achieved by simply transferring the procedures and activities of educationally-based programs for 3- to 5-year-olds into the hospital-based programs for younger children. In addition, the medically fragile infant in need of early intervention programs will have different needs than the medically fragile toddler. Furthermore, based on anecdotal evidence and a meager but growing research literature, there is some evidence that the most successful programs are those which begin in the hospital where many of these children spend the first four to six months of their lives. Thus the passage of P.L. 99-457 has brought into sharper focus the challenges to be faced by researchers in this area over the next few years.

The institute has focused a major part of its longitudinal research on infants and young children with some type of cerebral insult as a result of intraventricular hemorrhage, and on preschoolers who have suffered some type of traumatic brain injury due to automobile accidents, near drowning, and viral infections. We are also focusing on infants with bronchopulmonary dysplasia. A brief discussion of these studies and their implications follows.

Studies of Infants with IVH

We chose to study interventions with infants with intraventricular hemorrhage (IVH) because IVH is considered to be the most important neurological disorder presently found in low birthweight infants (Volpe, 1987). It occurs in about 40%

of low birthweight infants and is associated with many neurological and developmental handicapping conditions, including: cerebral palsy, vision and hearing disorders, and motor and cognitive deficits (Scott, Ment, Ehrenkranz, & Warshaw, 1984).

Since beginning the longitudinal intervention studies with infants with IVH, institute personnel have undertaken a series of studies designed to provide further information about IVH infants. A brief overview of each of these studies and their major findings is presented next

One major research concern is the long-term outcomes for infants who experience IVH. In examining the outcome literature, it became apparent that there were very few follow-ups of IVH children beyond 36 months of age. Those few available follow-ups (Catto-Smith, Yu, Bajuk, Orgill, & Astbury, 1985; Papile, Munsick-Bruno, & Schaefer, 1983; Williamson, 1983) reported significant correlations between severity of hemorrhage and incidence of handicapping conditions, concluding that the more severe the hemorrhage, the higher the incidence of major disabilities. We designed a longer-term follow-up to test this conclusion.

We initially began this follow-up with a group of 29 4- to 6-year-old children who had suffered IVH while in NICUs (Goodwin, 1986). The children were classified into mild and severe groups based upon the severity of hemorrhage, and assessed in the areas of cognitive, motor, language, abstract reasoning, and behavioral functioning. Medical sequelae of IVH and assessment results were analyzed using a discriminant function analysis. The mild and severe groups were classified appropriately by the medical problems but not by the outcome measures. Both groups were performing below norms for the assessment instruments used; however, there were no significant differences between mild and severe groups on cognitive, motor, language, or behavioral functioning at preschool age. Other medical sequelae common to LBW infants, such as seizure disorder and birth asphyxia, were found to be significantly related to neuropsychological outcomes in this study.

These initial results indicate that the severity of the IVH may be an immediate predictor of neurological damage; yet, severity of IVH may not predict long-term outcome. Another question is whether outcome for LBW infants with IVH is attributable to the hemorrhage or if the outcome is due to low birthweight and its associated medical complications. We next expanded our data set to test this hypothesis.

We assessed 21 additional 4- to 6-year-old children who had suffered IVH and combined this data set with the 29 assessed previously, for a total of 50 IVH children. Our major conclusions from the expanded analysis were that severity of IVH is not predictive of outcomes at ages 4-6, and that birthweight and incidence of medical complications may predict outcomes better than severity of IVH. We tested this hypothesis in our next follow-up study.

This study (Wingate-Corey et al., 1988) consisted of a two-group quasi-experimental design. The purpose of the study was to examine the differences in medical problems at birth and neuropsychological and behavioral status at five years for infants who had low birthweight, with and without perinatal intraventricular hemorrhage. The specific hypothesis tested was that children tested between five and six years of age, who had low birthweights, and suffered perinatal IVH, would not differ significantly on maternal obstetric factors, infant medical concommitants, neuropsychological measures, or behavioral measures from LBW infants without IVH when assessed at 5 to 6 years of age.

This study found that on family demographic data and socioeconomic status the two groups were comparable. The group with IVH had significantly lower birthweights and gestational ages than the non-IVH group. In addition, the IVH group had significantly more post-birth medical complications than the non-IVH group. These medical complications included metabolic acidosis, hyaline membrane disease, bronchopulmonary dysplasia, pneumonia, apnea, patent ductus arteriosus, post-hemorrhagic hydrocephalus, thrombocytosis, and retinopathy. In addition to having significantly more medical complications at birth, the IVH group also had more life-saving medical procedures performed in the NICU.

In terms of medical outcome for the first five years post-birth, it appears from the results of this study that the IVH infant will return to the hospital more and have more surgeries than the non-IVH low birthweight infant. In addition, the IVH child will probably have more long-term vision, feeding, and breathing problems. Seizure disorders are also more common among the IVH group than the non-IVH group.

Cognitively, according to results of this study, the IVH group is functioning significantly lower on measures of verbal, quantitative, performance, and memory abilities. The IVH group also performed significantly lower on measures of fine and gross motor performance. The IVH group, behaviorally, is judged by parents to score significantly higher on the hyperkinesis scale of the Conner's Symptom Checklist. When analysis of covariance is used to hold birthweight, gestational age, and age at testing constant between the two groups, however, the differences between the groups on all the tests are no longer statistically significant.

These results do indicate that infants with IVH, largely due to the concomitant low birthweight, early gestational age, and post-birth medical complications, tends to function at a lower level on measures of cognitive, performance, and verbal skills at 5-6 years of age than the low birthweight infant who does not suffer IVH.

Concurrently with the follow-up studies, we conducted a study to examine the maternal, obstetric, and neonatal correlates of IVH in infants, and began longitudinal intervention studies with IVH infants at three sites. The implications of the correlational study are discussed next, followed by the implications to date of the longitudinal studies.

As noted earlier, the attempt to identify risk factors or correlates of IVH has been constrained by conflicting research findings, changing hypotheses about the etiology of IVH, and by the exceedingly complex nature of this neurological disorder. In addition, few studies have investigated the possibility that antenatal factors might predispose the infant to IVH. Thus, research aimed at identifying IVH correlates from all time periods in which stress could occur to the neonate needed to be undertaken. This next study (Elghammer, 1988) was conducted for the purpose of identifying and quantifying correlates of IVH by constructing an interactive statistical model to predict the occurrence, severity, and onset of IVH.

The study sample was composed of neonates admitted to the University of Utah Medical Center's NICU from July 1985 to June 1987. Ultrasound brain scans were used to assign 150 infants into two groups of equal numbers: an IVH group and a non-IVH group. Forty-three maternal, 17 obstetric, and 35 neonatal variables were collected from the medical records of the infants and their mothers, including demographic, medical, and behavioral data.

The mean birthweights and gestational ages for the IVH and non-IVH groups were 1413 g, 29.9 weeks, and 1573 g, 31.3 weeks, respectively. Factors found to be associated with IVH were neonatal hypotension, bronchopulmonary dysplasia, lower hematocrit percent, pulmonary interstitial emphysema, severe respiratory distress syndrome, shorter gestational ages, lower 5-minute Apgar score, pneumothorax, shorter umbilical cord lengths, and lower maternal hemoglobin concentrations. No obstetric factors were found to be related to IVH. This last finding has important implications for the medical community because delivery by caesarian section had been recommended at one time as a means of preventing IVH.

The 10 factors found to have the highest correlations with IVH were then entered into an interactive statistical model along with gestational age and certain medical complications. This model accounted for 90.9% of the sample variability in IVH severity.

The ability to predict the occurrence and severity of IVH has several practical and theoretical implications as follows:

1. The data used in the construction of the predictive model were, with the exception of umbilical cord length, routine NICU measurements. The predictive equation could be entered into a computer, and calculations for the severity of IVH could be made for each infant.

2. The early identification of infants at high risk for IVH might allow for more intensive monitoring to be made prior to the onset of IVH.

3. Investigations using experimental treatments to reduce or eliminate IVH could, prior to the administration of the treatment, calculate the predicted IVH severity and use these values to judge treatment effectiveness.

4. It was observed that the R^2 values for the severity prediction model almost doubled when the interaction of correlates was added. This clearly demonstrates that no single factor, in isolation, is able to accurately predict IVH severity.

5. Although regression models cannot be used to suggest causal relationships, the finding that two predictors of IVH occurred in the antenatal period can be used as evidence to support the hypothesis that factors occurring prior to birth may interact with neonatal variables to initiate IVH. These antenatal variables might predispose the infant to IVH by damaging or compromising neural tissue. Germinal matrix zone injury, or ischemic brain damage occurring prior to birth, might not be detected by ultrasound or CT if the lesions are small (Bozynsky et al., 1987).

One area of research which might clarify some issues in the prediction of developmental sequelae is examination of the early functional characteristics of infants with histories of complications. While a group of infants who have suffered IVH may show a lower average score on a developmental measure, prediction of the developmental course of an individual infant is notoriously poor. Part of the problem may lie in the fact that while all infants in the group suffered the complication, some infants were more affected than others. Two areas of research, cry analysis (Huntington, Hans, & Zeskind, 1988; Zeskind, 1985) and heart rate analysis (Fox & Porges, 1985; Porges, 1983), show promise of discriminating those infants who have been most affected by complications. EIRI has recently begun a study of cry characteristics of infants with IVH.

The longitudinal intervention studies are comparing the long-term outcomes for IVH infants and their families under two experimental conditions. Condition I consists of follow-up medical care and a sensori-motor intervention programs beginning upon discharge from the NICU and initially lasting 18 months. Condition II consists of routine medical care for the first 18 months followed by an intervention program beginning at 18 months. We are currently analyzing the preliminary data from these studies, and the implications to date are as follows:

1. Sensori-motor interventions which begin shortly after birth ameliorate or lessen the impact of IVH.
2. Parents can be trained to deliver such interventions in a cost-effective manner.
3. The stress levels of parents delivering interventions remain at normal levels.

These studies regarding infants with IVH have clarified the role of birthweight and medical complications in outcome for this group of medically fragile infants. In addition, we are investigating the long-term effects of intervention upon the growth and development of these infants.

An opportunity exists in the IVH studies to make comparisons across research sites. Table 1 provides data relating to the comparability of the three sites on basic demographic data. As may be noted from Table III.1, the Salt Lake City parents have a much higher percentage of two parents at home, are slightly older, have slightly higher education levels, and have fewer persons receiving public assistance. South Carolina and LSU have higher percentages of non-Caucasian infants enrolled, and LSU reports a much lower total household income.

On infant characteristics reported in Table III.2, Salt Lake City reports higher mean birthweights, and reports significantly fewer infants with respiratory distress syndrome than does South Carolina. South Carolina has a lower percentage of infants with bronchopulmonary dysplasia.

When posttest measures of chid functioning are compared, the Salt Lake intervention group scores significantly higher (ES = .64) than the South Carolina

Table III.1
Comparability of Parents on Demographic Characteristics Salt Lake City (S.L.C.), South Carolina (S.C.), L.S.U.

Variable	Delayed Intervention			Early Intervention		
	S.L.C.	S.C.	L.S.U.	S.L.C.	S.C.	L.S.U.
o Age of mother in years	29.1	27	27	27.8	28	24
o Age of father in years	29.8	30	28	31.4	31	25
o Years of Education for mother	12.9	12.4	11	12.9	12.7	11
o Years of Education for father	13.0	12.3	12	14.7	12.7	12
o Percent with both parents living at home	97	69	44	92	64	20
o Percent of children who are Caucasian*	83	52	11	92	37	10
o Household Income	$24,414	13,760	2,376	$30,140	17,783	4,112
o Percent receiving public assistance	21	45	78	28	45	70

Table III.2
Comparability of Infant Groups on Demographic Characteristics Salt Lake City (S.L.C.) and South Carolina (S.C.)

Variable	Delayed Intervention		Early Intervention	
	S.L.C.	S.C	S.L.C.	S.C.
o Birthweight (g)	1630	1110	1215	1057
o Grade of IVH)% with Grades 3 and 4	37	54	29	60
o Gestational Age (Wks)	31.1	29	29.2	28
o 1 minute Apgar	4.1		3.9	
o 5 minute Apgar	6.1		6.2	
o Apnea (%)	50	45	67	54
o Seizures (%)	10	4.2	17	20.8
o Respiratory Distress Syndrome (%)	7	79	17	82
o Bronchopulmonary Dysplasia (%)	53	37	79	46

intervention group. Since the interventions being delivered are comparable at both sites, these differences will be examined closely in future analyses to see if they hold up and to ascertain if there are child, family, and intervention differences between sites. Table III.3 presents posttest measures of child functioning at two sites.

Table III.3
Posttest Measures of Child Functioning for Alternative Intervention Groups
Salt Lake City (S.L.C.) and South Carolina (S.C.)

Variable	Delayed Intervention Group		Early Intervention Group	
	S.L.C.	S.C.	S.L.C.	S.C.
o Age in months at Posttest	17	14	19	14
o Battelle Developmental Inventory (BDI)				
DQs for:				
Personal Social	78	68	85	57
Adaptive Behavior	88	81	88	72
Motor	84	67	84	62
Communication	80	82	84	70
Cognitive	81	77	81	75
TOTAL	84	77	87	68

Preschoolers with Traumatic Brain Injury

Our second research thrust with medically fragile infants and young children is with a previously overlooked group of preschoolers; those young children who are developing normally but who suffer a traumatic brain injury during the first years of life.

Accidental trauma is the leading cause of death in children in the United States. Investigations of the outcomes of children surviving head trauma have shown that they have persistent and marked developmental decline following severe injury (Brink, 1980; Levine, 1983). Moreover, the 0-3 age group has shown a greater vulnerability than older children. In follow-up studies, only 5% of children who have sustained severe head trauma are shown to be performing within normal limits by the time they enter school (Gerrins, 1986).

With respect to near-drowning patients in PICUs, improved management has led to increased concern that survivors will manifest neurological disabilities at some later point (Oakes, 1985). Those children surviving warm water, near-drowning episodes (such as those in pools) have a worse prognosis than those who were immersed in cold water (Frates, 1981). It was also shown that children admitted with a Glascow Coma Scale (GCS) score of 3 invariably displayed severe neurological sequelae. (The GCS is a measure of neurological functions of children who are comatose.) Fifty percent of those achieving a GCS of between 3-5 displayed similar problems. Most children scoring greater than 5 recovered normal neurological functioning, although subtle findings such as learning difficulties were not investigated.

Finally, regarding victims of severe meningitis, between 1 and 5% of affected children die, and 20-30% of children who survive can be expected to show serious neurodevelopmental sequelae. Morbidity includes mental retardation, quadriparesis, blindness, deafness, and epilepsy, as well as less severe deficits of sensory motor and intellectual functioning (Bresman & Hicks, 1983). As noted earlier, it has been shown that younger children, especially those at or below one year of age, are at high risk for having major sequelae (Herson, 1977).

The major goal of the research project is to test the effectiveness of an early intervention program for 0- to 3-year-old victims of severe trauma, near drowning, and severe meningitis and their families. The program is structured around four components derived from systems theory: (1) a collaborative system of medical and educational follow-up; (2) a structured, home-based intervention model that includes the development of an Individualized Family Service Plan (IFSP) with extensive family input; (3) a coordinated plan to involve ancillary service providers; and (4) a procedure for transitioning children from the home- to center-based pre- and public schools.

The major implications of this project, in addition to testing the effectiveness of interdisciplinary and interagency teamwork in meeting the needs of preschoolers who suffer traumatic brain injury and their families, focus on two important questions. The first relates to the families of these preschoolers. Do families who have a normal infant who later becomes handicapped differ from families of infants who are medically fragile from birth on? This project will generate important information as we attempt to answer this question. Second, does early intervention for preschoolers with traumatic brain injury lead to improved child and family outcomes which are maintained over an extended period of time?

Studies of Infants with Bronchopulmonary Dysplasia

Another medical condition associated with a substantial number of long-term disabilities is the presence of chronic pulmonary disease (bronchopulmonary dysplasia) at the time of NICU discharge. Bronchopulmonary dysplasia (BPD) is a unique disorder of the newborn infant who requires mechanical ventilation and oxygen therapy at birth. Advances in the intensive care of the premature infant with lung disease at birth have resulted in dramatic increases in survival over the past two decades. However, the disorder of BPD has become increasingly frequent as smaller and smaller infants survive, affecting up to 40% of surviving infants (less than 1500 g at birth). The most frequent handicaps include growth failure (nearly 100% of infants), developmental delays (10-30%), neurologic insults (20%), visual problems (7-10%), and deafness (5-10%). The post-neonatal death rate is increased substantially higher in this population (up to 25% of post-neonatal deaths), and the incidence of re-hospitalization during the first year of life is dramatically increased in this group of infants, with up to 30% being re-hospitalized in infancy. Thus, this group of infants have substantial health problems beyond the neonatal period.

The BPD infant represents an ideal subject for testing interventions which begin in the NICU and provides a transition to community-based programs. The biosocial systems model of development serves as the theoretical foundation for intervention services. The intervention begins with four hospital-based visits with families one month prior to hospital discharge and continues with weekly home-based intervention services for the first two years of the infant's life. This program uses a family-focused, home-based delivery system for all components, which include health, nutrition, education, parent-infant interaction, and social support.

This research study will have important implications for interdisciplinary and interagency teamwork in meeting the needs of the medically fragile infant. Since many of these infants will be re-hospitalized during the first year of life, communication and cooperation between NICUs and community-based programs will be imperative if the interventions are to succeed.

Summary

The research projects with medically fragile infants and young children are expected to add to the knowledge base in early intervention in several important areas. Those areas are summarized in the following list. We will have information relating to the following questions:

1. Can interventions begin in NICUs and then transition effectively to home and community services?
2. Will these interventions result in ameliorating the effects of handicapping conditions and have positive effects on the family?
3. Does the concept of interdisciplinary and interagency collaboration work for these children and their families?
4. Do the families of infants who have a handicapping condition from birth differ on important dimensions from families of normal infants who suffer a traumatic brain injury in the first three years of life?
5. How cost-effective are interventions which begin in NICUs, have a family focus, and allow for two-way transitions?

6. Can examination of an infant's behavioral and psychophysiological characteristics enhance the ability to predict which infants will need and/or benefit most from early intervention?

A Preliminary Comparison of Parent-Infant Interaction Coding Systems

In recent years, mother-child interaction has been cited with increasing frequency as an important variable to measure in conjunction with implementing, conducting, and evaluating early intervention programs (Bailey et al., 1987). This evolving emphasis on mother-child interaction is attributable to several key factors. The importance of the parent-child relationship to the child's overall growth and development has long been an accepted construct in the social sciences (Bronfenbrenner, 1977; Wright, Granger, & Sameroff, 1984). Although much of the early intervention research with infants has focused on IQ and found disappointing results (Casto & Mastropieri, 1986), many researchers have postulated that more important changes are occurring in mother-child interaction which are not being measured (Marfo, 1984; Russo & Owens, 1982). If something as basic, pervasive, and enduring as mother-child interaction is in fact being altered through early intervention, then researchers may be overlooking dramatic long-term effects of early intervention. Thus, the importance of including measures of mother-child interaction in the study of early intervention should not be underestimated.

In order to examine the effects of early intervention on mother-child interaction, the Early Intervention Research Institute has videotaped more than 200 mother-child dyads at six sites. These sites include the University of Utah Medical Center (Utah), Community Action for Parental Success (Louisiana), Medical University of South Carolina (South Carolina), the Interagency Project for Early Intervention (SMA/Lake McHenry, Illinois), Developmental Disabilities Inc. (Utah), and the Louisiana State University Human Development Center's Visually Impaired Program (Louisiana). Videotapes depict a sequence of activities involving free play, picking up toys, looking at a book, and observing the child while the parent leaves the room for 45 seconds. The entire sequence takes 16 minutes. Videotapes are taken at the time of posttest and at subsequent posttesting where possible.

No one system of coding parent-child interaction has received overwhelming support in the field. In fact, a number of systems exist, derived from diverse theoretical frameworks and with varying levels of reliability and validity. We used the list of 26 systems identified by Towle, Farran, and Comfort and applied the following criteria in selecting the systems to be used with our data. It was desired that the systems could be used within a common free-play setting, with children having a variety of handicapping conditions, and with both infants and preschoolers. Seventeen of these systems met this requirement. Next, the systems considered for use in this study were further limited to those which represented a broad spectrum of methods, from global rating assessments to behavioral-count analyses of sequential behaviors. Finally, the selection was narrowed to those systems which had been used repeatedly in the field. Four systems have been chosen for use in coding the EIRI videotapes. (We felt it desirable to use more than one system in order to evaluate the usefulness of the systems and to assess their relative advantages and disadvantages.) A summary of the characteristics of these four systems, their psychometric adequacy, and conclusions of past research using the systems is found in Table III.4.

The videotapes are currently in the process of being coded. The parent-child videotapes are coded by the actual developers of the observational systems in order to eliminate potential error due to possible misuse or misunderstanding of the systems. All coders have agreed to recode 10% of the tapes they receive for reliability purposes.

The Response Class Matrix System is being used to code the parent-infant interaction tapes from the University of Utah Medical Center, Medical University of South Carolina, and Community Action for Parental Success (IVH sites). The Parent-Child Behavioral Observation System is being used to code the tapes from the

Table III.4
Characteristics of Mother-Child Interaction Systems for the Proposed Study

System	Characteristics of System	Conclusions of Past Research	Evidence on Psychometric Adequacy
Parent-Caregiver Involvement Scale Comfort & Farran (1986) Farran, Comfort-Smith, & Kassari (1985) Farran, Kasari, & Comfort-Smith (1985) Kasari & Farran (1984)	A trained rater scores maternal behavioral descriptors on a five-point scale. The PCIS consists of 16 items, with the first 11 being physical involvement, verbal involvement, responsiveness of caregiver to child, play interaction, teaching behavior, control over child's activities, directives, relationship among activities, positive statements, negative statements/discipline, and goal setting. Each of the behaviors is rated on three dimensions: amount, quality, and appropriateness. Five items allow the rater to make a global assessment of the interactions: availability of parent to child, general acceptance and approval manifested by parent, general atmosphere of parent-child interactions, enjoyment, and provision of a learning environment.	Significant difference in maternal behavior with handicapped infants were found with respect to parental locus of control, social support, and child temperament (Comfort & Farran, 1986).	Has been found to be reliable both across raters and over time (Comfort & Farran, 1986). Interrater correlations yielded the following 6 coefficients for a videotaped lab: amount .89, quality.98, appropriateness .82, and impression. 54. Interrater reliabilities were amount .95, quality .92, appropriateness .95, and impression .91.
The Maternal Behavior Scale Mahoney, Powell, & Finger (1986) Mahoney, Powell, Finnegan, Fors, & Wood (1986) Mahoney, Finger, & Powell (1985)	Assess 7 characteristics that have been reported to relate to children's development, including: enjoyment, sensitivity to state, responsiveness, appropriate stimulation, physical stimulation, directiveness, and sensitivity to interests. Scale was compiled from various global maternal rating scales reported in the child development literature.	Mentally retarded children who had the highest Bayley mental Development scores had mothers who were neither highly controlling nor very directive (Mahoney, Finger, & Powell, 1985).	Interrater reliability coefficients range from .76 to .81, and percentage agreement within one scale point ranges from 93% to 100% for all items.
Parent-Child Behavioral Observation System Marfo & Kysela (in press)	Examines behavior as a dynamic process. Child behaviors measured include: physical contact, positive expressive gesture, negative expressive gesture, smile, look, imitate, positive vocalization, negative vocalization, aggressive-destructive, and compliance to verbal instructions. Mother behaviors measured include: physical contact, positive expressive gesture, negative expressive gesture, smile, look, imitate, stimulation with materials, verbal reinforcement, negative verbalization, verbal stimulation, label, expand, instruct, and physical guidance.	Found that maternal directiveness did not necessarily detract from dyadic interaction and that changes in behavior due to intervention were qualitative and effective in nature (Marfo & Kysela, in press).	Interobserver agreement was calculated with by formula: number of agreements divided by the sum of agreements and disagreements. The reliability sessions was .78. Average interobserver reliabilities for children's behaviors averaged .75, and maternal behaviors .82.
Response Class Matrix System Mash & Barkley (1986) Cunningham, Reuler, Blackwell, & Deck (1981) Mash & McElwee (1976) Mash & Terdal (1973) Mash, Terdal, & Anderson (1973)	One observer records the mother's response (command, command-question, praise, negative, question, interaction, or no response) to specific antecedent behaviors of the child (compliance, competing response, independent play, negative, interaction, or no response). A second observer simultaneously codes the child's response (compliance, independent play, question, negative, interaction, or no response) to specific behavioral antecedents of the mother (command, command-question, question, negative, praise, interaction, or no response).	Training parents in behavior techniques resulted in a decrease in mother's directiveness and questions while increasing interaction. An increase in children's responses to commands, questions, and interactions was also found (Mash & Terdal, 1973).	Interrater reliability has usually exceeded 80%, with some minor variations from study to study.

NOTE: References available upon request.

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Interagency Project for Early Intervention and the Louisiana State University Human Development Center's Visually Impaired Program. (Moderately to severely handicapped children are served at the former and visually impaired children are served at the latter). The Maternal Behavior Rating Scale is being used to code the tapes taken at Developmental Disabilities Inc., which also serves moderately to severely handicapped children. The Parent-Caregiver Involvement Scale is being used to code all of the tapes, allowing comparisons between this system and the Response Class Matrix System, the Parent-Child Behavioral Observation System, and the Maternal Behavior Rating Scale.

Following receipt of the parent-child interaction data from the coders, we will begin analysis to compare the interactions of those in the experimental (or high intensity) groups with those in the control (or low intensity) groups. Other comparisons will utilize data from the child and family functioning measures to more fully evaluate the relationship between mother-child interaction and the ecological context of that relationship. Recent work has emphasized the importance of studying the interaction of mothers and handicapped children in the context of other factors such as family resources, support, and stress (Schneider & Gearhart, 1988). Finally, the development of parent-child interaction will be studied at sites such as Developmental Disabilities Incorporated and the University of Utah Medical Center, where children and their parents have been followed longitudinally over a year's time. Both stability and change in parent-child interaction will be examined.

Thus, through the evaluation of parent-child interaction using a videotaped measure, we hope to gain important insights into the effects of early intervention on the mother-child relationship, both within the larger ecological context of the family and as it changes and develops over time.

Assessment of Family Functioning

Assessment of family functioning in families involved in early intervention was seen as a critical component because, until recently, research and program evaluation efforts in early intervention have focused on developmental changes in children where measures of intelligence have been the most used. Intervention personnel have long noted anecdotally the impacts of such programs on families, but little attention has been paid to collecting data on the family. In fact, a recent review of outcomes measures utilized in early intervention efficacy research conducted by the Early Intervention Research Institute (EIRI) staff (see White & Casto, 1985) revealed that family outcomes were assessed so infrequently that they were not listed as a major category but were included under "other." Table III.5 below depicts this information.

Table III.5

Outcomes Assessed in Early Intervention Research

	Handicapped		Disadvantaged	
	N_{es}	Percent	N_{es}	Percent
IQ	81	38	385	43
Social Competence	38	18	67	7
Language	37	17	189	21
Motor	31	14	45	5
Academic Achievement	5	2	128	14
Other	23	11	92	10

Since families are a legitimate target for intervention efforts, it seemed very important to EIRI staff to emphasize the collection of family-related data as part of any effort to document the efficacy of early intervention. Accordingly, EIRI staff did a significant amount of preliminary work in selecting family assessment instruments for use in the 16 longitudinal studies. These preliminary activities included conducting a conference at which nationally recognized consultants addressed important family involvement issues, including assessment of family functioning. Institute staff also conducted a comprehensive review of available instrumentation for assessment of family functioning.

Types of Family Measures Included in EIRI Research

In attempting to decide which family assessment measures to use, EIRI staff had to decide what the important family-related outcomes of early intervention are. Bailey and Simeonsson (1986), for example, would focus on such broad outcome areas as changes in the quality of the home environment, changes in the quality of the interactions between family members and the handicapped child, and changes in family coping skills. Moran (1985) would add measures of family stress; and Dunst (1983) has recommended a number of measures of social support and has identified the family level characteristics which they assess. These characteristics include social support (intrafamily, kinship, extrafamily), wellbeing (physical, emotional), coping, family integrity, parental attitudes, and child expectations.

In selecting instrumentation then, EIRI staff, guided to a large extent by expert opinion and comprehensive reviews of the literature, were able to identify the following outcome areas as being important to the research endeavor:

1. **Assessment of Parent-Infant Interaction**. This construct has long been of importance in research with normal infants, but has recently assumed a great deal of importance as an outcome variable for handicapped infants and their families. Many researchers are now suggesting that improved mother-infant interactions may be one of the direct results of early intervention programs (Marfo, 1984).

The EIRI approach to measuring parent-infant interaction has been to develop a standardized protocol for assessing parent-infant interaction, which could be scored using a number of different, widely-used systems. Some preliminary results from a comparison of three coding systems appears later in this section.

2. **Assessment of Family Stress**. One of the negative effects of having a handicapped child in the family has been hypothesized to be increased levels of family stress caused by the added responsibilities required in parenting a handicapped child. The EIRI rationale for including a measure of family stress is that the construct is widely recommended in the intervention literature as an outcome variable and a useful scale exists for measuring the construct.

To assess levels of stress with the family, EIRI adopted the Parenting Stress Index (PSI) (Abidin, 1983). The measure is especially useful in the first three years after birth, since this is a critical emotional and behavioral period of the parent-child interaction.

3. **Assessment of Family Resources**. The resources available to families are thought to play an important role in the effectiveness of a given intervention. Our rationale for including an assessment of family resources was to determine its importance as a mediator of intervention effectiveness.

The Family Resource Scale (Dunst & Leet, 1985) is being used to measure the adequacy of various resources in families with young handicapped children. The measure is divided into a hierarchical system of physical and instrumental support and four broad categories of support: general resources, time availability, physical resources, and external support.

4. **Assessment of Supports Available to the Family**. In addition to resources available, the availability of support systems for families with young handicapped children is thought to be an important variable in intervention effectiveness (Dunst, 1983). Our rationale for including an assessment of support systems again,

was to determine the importance of support systems as mediators of intervention effectiveness.

To assess support systems available to the family, the Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984) is administered. The FSS measures the "degree to which different sources of support have been helpful to families rearing young children." This questionnaire was established to measure satisfaction with, and perceived helpfulness of, support. The items are grouped into six support systems: Informal Kinship, Social Organizations, Formal Kinship, Nuclear Family, Specialized Professional Services, and Generic Professional Services.

5. **Assessment of Basic Family Structure**. The family life literature is replete with discussions of the importance of various family types in contributing to the wellbeing of infants and young children. We felt it necessary to see if family type has the same implications for families with handicapped children. To assess basic family structure, we chose to use the Family Adaptation and Cohesion Scales (FACES III) (Olsen, Portner, & Lavee, 1983). To assess changes in family structure over time, we chose the Family Inventory of Life Events and Changes (FILE) (McCubbin et al., 1983).

FACES III was developed to assess two major dimensions on the circumplex model--adaptation and cohesion of the family. The circumplex model is a classification system of 16 family types and three or more general types--balanced, mid-range, and extreme. The measure can be used with families across the life cycle.

Family cohesion assesses degree of separation or connection of family members to the family. There are four levels of family cohesion ranging from extreme low cohesion to extreme high cohesion--disengaged, separated, connected, and enmeshed. The separated and connected levels of cohesion are considered moderate or balanced. Family adaptability assesses the extent to which the family system is flexible and able to change in various situations. There are four levels of family adaptability ranging from extreme low to extreme high adaptability--rigid, structured, flexible, and chaotic. Flexible and structured are considered moderate or balanced levels of adaptability. In each dimension, the balanced levels are hypothesized to be most indicative of healthy family functioning, while extreme areas are generally considered to indicate problems in family functioning over time.

The Family Inventory of Life Events and Changes (FILE) assesses life events and changes experienced by the family during the past 12 months. Dimensions assessed by the 71 items included in the FILE are: intra-family strains, marital strains, pregnancy and childbearing strains, finance and business strains, work-family transitions and strains, illness and family care strains, losses, transitions in and out, and legal strains.

6. Assessment of Family Characteristics. Certain family characteristics, such as socioeconomic status, are thought to be associated with intervention effectiveness. We are collecting extensive demographic data to determine the role of family demographics in intervention effectiveness. Accordingly, we have developed a parent survey to collect extensive demographic information related to the families in experimental and comparison groups.

Family Characteristics, Family Type, and Stress in Families with Children who are Handicapped

The impact on the family of having a child who is handicapped has generated increasing attention in the past several years (Dunst, 1985; Turnbull, Summers, & Brotherson, 1983). Studies have investigated factors that compound stress levels as well as those that ameliorate them, and a number of scales have been developed that purport to measure levels of stress (e.g. Abidin, 1983; McLinden-Mott & Braeger, 1988). Among factors reported to impact on perceived levels of stress are family type (Olson & McCubbin, 1983) and the sources and amount of support available (Dunst, Trivette, & Cross, 1988). No clear relationship between family demographic characteristics and stress have been reported, although Farber (1959) suggested that low SES families were less likely to institutionalize a child than high SES families. Crnic, Friedrich, and Greenberg (1983) noted that few studies have been conducted that address family adaptation over time or that include data on such factors as child age, severity of handicap, physical health, or family outcome. Data on all of these factors are being collected in the present investigation.

Using data on over 500 families participating in the longitudinal studies being conducted at the Early Intervention Research Institute at Utah State University, we investigated the relationships between family type, stress, and family demographics and sources of support. The instruments included in this analysis were the measures described earlier, including the Parenting Stress Index (PSI), the Family Adaptability and Cohesion Evaluation Scales (FACES), the Family Support Scale (FSS), the Family Resource Scale (FRS), and a family demographic survey developed at EIRI.

Method

Data were collected on the above measures at pre- and posttest as described in later sections of this report. Data from the PSI were correlated with the FACES adaptability and cohesion subscales, demographic data, the FSS scales, and the FRS scales. Categorical data from the two FACES subscales were included as independent variables in a set of MANCOVAs, with demographic data, FSS, and FRS subscales as covariates. Regression analyses were conducted with demographic, and support and stress variables (with stress as the dependent variable) to determine which variables to include as covariates in the MANCOVAs.

Results

Initial analysis indicated that with respect to stress, the cohesion subscale of the FACES was associated with stress as measured by the PSI, but there was no relationship between adaptability and stress. Demographic and support measures also differed based on levels of family cohesion.

Demographic data, family type, and stress. The only demographic variable found to correlate above .20 with the FACES adaptability subscales at pretest was income ($r = .22$, $p < .001$, $N = 556$), while both income and receipt of public assistance correlated with the cohesion subscale (Table III.6). Because only one of the seven family support subscales correlated with the adaptability subscale, further analyses of this subscale were not conducted. Six of the seven support subscales correlated with the cohesion subscale.

Table III.6

FACES Cohesion Type

Demographic Variable	Disengaged (N = 123)	Separated (N = 173)	Connected (N = 191)	Enmeshed (N = 89)
% Caucasian***	72.1	79.3	88.1	90.9
% Mothers Married***	56.8	65.5	83.3	85.6
% Mothers in Technical/ Managerial Positions**	5.8	12.4	16.7	22.1
% Fathers in Technical/ Managerial Positions*	24.2	30.5	42.4	38.5
Income***	18,528 (17,087)	22,860 (17,206)	28.650 (20,907)	29,952 (19,256)
Mother's Education***	12.13 (2.4)	12.63 (2.1)	13.35 (2.3)	13.13 (2.7)
Father's Education***	12.2 (2.5)	13.2 (2.2)	13.7 (2.4)	13.6 (2.5)

* $p < .05$

** $p < .01$

*** $p < .001$

Correlations between the PSI scales and FACES measures are presented in Table III.7. The cohesion and adaptation subscales were converted to categorical variables according to criteria established by Olsen et al., 1983. To determine whether there were demographic differences between cohesion and adaptation groups, a series of ANOVAs was then run with cohesion as the independent variable and demographic variables as dependent. Significant group differences were found only in the cohesion scale. The four cohesion categories are "disengaged," "separated," "connected," and "enmeshed." These analyses indicated that there were significant differences in the percentage of families with both parents in the home, parental education and occupation, income, and percent of families receiving public assistance. In each case, a direct linear relationship was found. More cohesive families were more likely to have both parents in the home, higher education and income, and fewer cases receiving public assistance.

Table III.7

Parenting Stress Index

N = 607	Total	Child	Other
FACES Cohesion	-.27**	-.16	-.29***
Adaptation	-.05	-.02	-.04
Cohesion Distance from Ideal	-.13*	-.06	-.14**
Adaptation Distance from Ideal	.13**	.12*	.11*
Total Distance from Ideal	-.02	.03	-.04

* p < .05

** p < .01

*** p < .001

The only demographic variable that correlated above .20 with stress was income, which correlated -.23 and -.21 ($p < .001$ in each case) with PSI total stress and PSI stress on the parent (as opposed to child related stress). Thus higher income mothers reported less stress than mothers in lower income families.

As in the case of demographics, correlation and categorical data across the adaptability and cohesion subscales of the FACES and the PSI data indicated that only the cohesion scale was related to levels of stress. As can be seen in Tables III.6 and III.7, more cohesive families reported less stress. The regression analyses indicated that the mother's total score on the FSS should be used as a covariate on all PSI scales, and that time availability (FRS) should be included on the total stress and parent related stress PSI scales, and total resources (FRS) should be included on the child related stress scale. Although none of the demographic variables were found to be relevant based on the regression analyses, income was included because, of the demographic variables, it most highly correlated with stress, and significant income differences were found based on cohesion type.

Statistically significant differences remained between cohesion types on the support variables (Table III.8) and on the total and parent related stress scales (Table III.9), after adjustment for the covariates. Approximately 17% of the variance in stress was accounted for by the covariates. Differences on the total PSI indicate that groups 3 and 4 (connected and enmeshed) were less stressed than groups 1 and 2 (chaotic and separated). The adjusted means for groups 1 and 2 are in the high stress range (> 80th percentile), while the averages for groups 3 and 4 are in the normal range. In the parent related stress domain, adjusted means are all in the normal range, but the linear relationship is still evident. Groups 1 and 2 are both above the 65th percentile, while groups 3 and 4 are in the 55th percentile. Adjusted means in the child related stress domain place all four

Table III.8

FACES Cohesion Type

Support Variable	Disengaged			Separated			Connected			Enmeshed			F
	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	
Family Support Score--Total	24.8*	10.5	125	29.0	10.8	179	30.9	11.3	198	31.4	12.4	90	10.89***
FSS--# of Sources	15.2	3.4	125	15.2	3.3	179	15.0	3.2	197	14.3	3.0	90	1.56
Family Resource Scale--Total	105.3*	21.3	123	117.3*	18.1	174	122.4*	18.3	183	125.2	15.7	83	26.34***
FRS--General	68.0*	14.1	125	75.5*	13.0	178	79.8*	12.3	197	80.5	11.0	90	25.89***
FRS--Time Availability	34.5*	9.3	125	39.8*	9.8	179	42.0*	10.0	198	43.4	9.0	90	19.81***
FRS--Physical Resources	28.4*	5.9	125	30.8*	4.3	179	32.0*	3.8	197	32.1	3.8	90	19.77***
FRS--External Support	28.4*	5.9	122	23.9*	4.1		24.8*	4.4	198	25.1	4.2	89	18.77***
FILE	12.8*	8.8	124	70.8*	6.6	176	9.6*	5.4	195	9.7	6.0	89	6.61***

* Significant difference in groups from left to right

*** $p < .001$

Table III.9

FACES Cohesion Type

PSI Stress		Disengaged (N = 123)			Separated (N = 173)			Connected (N = 191)			Enmeshed (N = 89)				
		$\bar{X}$	SD	Adj. $\bar{X}$	$\bar{X}$	SD	Adj. $\bar{X}$	$\bar{X}$	SD	Adj. $\bar{X}$	$\bar{X}$	SD	Adj. $\bar{X}$	F	P
Total	**Covariates** **FRSC** **FSSAM** **FILEA**	257	40	245	247	35	246	234	41	240	223	42	231	3.79	.010
Child Related	**Covariates** **FRSC** **FSSAM** **FILEA**	118	20	114	116	19	115	112	21	114	108	23	111	1.00	.394
Other Related	**Covariates** **FRSC** **FSSAM** **FILEA**	139	26	132	132	23	131	122	24	126	116	27	121	4.54	.004

groups in the high stress category, and the linear relationship is not evident, although groups 3 and 4 are slightly less stressed than groups 1 and 2.

The findings reported here regarding family type differ from those reported by Olson and McCubbin (1983) with respect to families with young children in that as cohesion increased, families exhibited less stress and reported greater satisfaction with support and more resources. Olson and McCubbin, in contrast, found that families in _either_ extreme scored high on measures of satisfaction and family support. Differences in stress levels for these families were not reported by Olson and McCubbin. They also reported that families differed on these variables based on FACES adaptation scores.

It is intuitively logical that more cohesive families should be less stressed and that these families should report more satisfaction with the sources of support available to them. The demographic differences also follow, in that income, marital status, and public assistance are known to be related. Families with higher incomes would tend to have two parents and to rely on public assistance less often. Two parent families would also seem to be more cohesive and less stressed, in that there is someone to help with problems and to share concerns with. Data reported here suggest that family cohesion is an important factor that can reduce stress levels associated with having a child with handicaps.

The association of time availability with parental stress is an indication handicapped children demand more time and attention than non-handicapped children. The fact that differences in PSI scores in the child domain were not statistically significant but _all_ groups fell in the high stress range supports this conclusion. Additionally, the averages for all groups fell in the upper ranges of stress, indicating that this group of parents is more stressed than standardization sample of parents used by Abidin (1983). The statistically significant difference in the parent domain may indicate that parents in more cohesive families are better able to separate child-related stress from other sources of stress.

Areas warranting additional investigation with respect to family type and stress are severity of child's handicap, type of handicap, health problems, and, as the study progresses, child age may become increasingly important. Changes in family type, stress, and other variables between test times also deserve attention. Olson and McCubbin (1983) hypothesized that families would change in type in response to varying sources of stress across the family life cycle. The longitudinal nature of the present investigation provides an opportunity to test this hypothesis. Changes stress level associated with changes in family type are likely to be interesting. Finally, associations between level of parental involvement, stress, and family type (reported in another section) will be of interest.

Relationship of Demographic and Family Functioning Variables to Parental Involvement

Rationale

Parental involvement in the child's education is nearly universally considered important, both for normal and handicapped children (Rosenberg & Robinson, 1988). It is likely that parental involvement is even more important when the child is handicapped, since handicapped children may be even less likely to overcome deprived surroundings. However, little is known about those factors which are related to parental involvement. For example, does maternal employment adversely affect parental involvement, since a working mother supposedly has less time for domestic duties than a full-time mother? Does family cohesion affect the level of parental involvement?

The purpose of this study was to determine which factors are related to parental involvement in their child's education. Both demographic variables and family functioning measures were considered.

Method

Subjects. Subjects were 716 children enrolled throughout the EIEI studies. Table III.10 shows the characteristics of these subjects.

Table III.10

Characteristics of Subjects in EIEI Studies

	Basic Intervention (Group #1)			Expanded Intervention (Group #2)			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
o Age of child in months as of 7-1-88	3.80	(1.57)	355	3.70	(1.62)	363	.410
o Age of mother in years	31.26	(6.71)	320	31.34	(6.89)	330	.884
o Age of father in years	33.79	(6.67)	301	33.99	(7.43)	311	.725
o Percent Male*	58%		355	61%		363	.353
o Years of Education for Mother	12.67	(2.44)	334	12.85	(2.33)	335	.329
o Years of Education for Father	13.11	(2.42)	310	13.19	(2.49)	311	.673
o Percent with both parents living at home	79%		324	83%		326	.258
o Percent of children who are Caucasian*	87%		286	89%		293	.455
o Hours per week mother employed	11.48	(17.21)	305	11.63	(16.87)	313	.912
o Hours per week father employed	37.62	(16.59)	261	39.37	(16.23)	277	.216
o Percent of mothers employed as technical managerial or above*	13%		322	15%		327	.477
o Percent of fathers employed as technical managerial or above*	36%		290	34%		292	.689
o Total household income	24070.10	(18264.97)	300	24766.23	(19677.21)	308	.652
o Percent receiving public assistance	37%		305	34%		311	.577
o Percent with mother as primary caregiver*	93%		300	93%		312	.859
o Percent of children in daycare more than 5 hours per week*	22%		299	21%		307	.789
o Number of siblings	1.60	(1.66)	322	1.51	(1.79)	335	.509
o Percent with English as primary language	97%		319	99%		326	

Procedures. The parents of the subjects completed the Parent Survey (i.e., the demographic form), Parent Stress Index, Family Support Scale, Family Resource Scale, and Family Adaptation and Cohesion Evaluation Scales III, were utilized in this analysis. These measures taken at pretest time were used to predict parental involvement, which was assessed at post test time.

Parental involvement was assessed through ratings of the parents by the child's teacher or intervenor. Teachers were asked to rate the parents as to whether they were low, moderate, or high in terms of involvement. Teachers rated parents on three aspects of involvement: parental support, parental knowledge, and parental attendance. Parental support included such activities as attending IEP meetings, nonrequired activities such as workshops, and keeping scheduled appointments. Parental knowledge included variables such as being knowledgeable about their child's handicapping condition, their child's right to an appropriate education, etc. Parental support measures such things as parental assistance in school projects, providing carryover of the child's goals into the home, completing required forms on time, etc. These three areas were summed to create an overall index of parental involvement.

Results and Discussion

A normal distribution of parental involvement scores was observed, indicating that teacher rating of parents was skewed neither negatively nor positively. Level of parental involvement was broken into nearly equal numbers of low, medium, and highly involved parents. Low involvement was a total score below 6, medium involvement was a total score of 6 or 7, and high involvement was a score above 8.

The results of the ANOVAs which were done on continuous variables can be observed in Table III.11 Level of parental involvement was found to increase with parental education (both mother and father, all groups significantly different), parental age (highly involved significantly different from medium and low involved), number of resources (highly involved significantly different from medium and low involved), and number of sources of support (highly involved significantly higher than low involved). Highly involved parents had more children, on the average, than did medium and low involved parents. Highly involved parents felt significantly less stress at pretest time than did low involved parents. (It

Table III.11

Relationship of Parental Involvement to Demographic and Family Functioning Measures

	Low Involvement			Medium Involvement			High Involvement			
	Mean	SD	N	Mean	SD	N	Mean	SD	n	p
Education--Mother	11.13	1.93	87	12.26	1.84	73	13.56	2.05	95	.000
Education--Father	11.51	2.12	77	12.68	1.73	66	13.77	2.29	96	.000
Age of Mother	29.43	6.50	86	29.14	6.03	74	33.00	5.76	95	.000
Age of Father	32.57	7.35	77	31.51	6.26	65	35.28	6.12	96	.001
Number of Siblings	1.5	1.67	88	1.31	1.18	74	1.90	1.41	98	.024
PSI-Total Stress	258.33	43.89	87	250.44	41.95	73	244.16	40.89	98	.076
PSI-Child	123.23	21.07	87	115.56	21.13	73	114.52	20.34	98	.012
PSI-Parent	135.13	26.67	87	134.88	25.23	73	129.59	27.25	98	.282
FSS-Total	25.72	11.17	79	27.15	10.48	66	30.09	12.04	93	.038
FRS-Total	109.16	18.73	83	112.35	17.62	65	119.37	17.87	94	.001
FRS-General Resources	69.67	12.60	83	71.57	12.62	65	78.14	12.06	94	.000
FRS-Time	37.22	9.89	83	37.65	8.14	65	39.54	10.68	94	.247
FRS-Physical Resources	29.06	4.43	83	29.65	5.16	65	31.40	3.92	94	.002
FRS-External Support	21.69	4.70	83	23.06	4.54	65	24.26	4.36	94	.001
FACE-Adaptability	9.65	7.13	78	7.20	6.14	65	6.88	5.57	94	.010
FACE-Cohesion	8.72	7.04	78	7.63	6.74	64	7.51	6.70	94	.468
FACE-Total	18.37	11.32	78	14.83	9.12	64	14.39	9.04	94	.021

should be noted that all groups fell into the "high stress" range, however.) Parental involvement was unaffected by perceived amount of time available.

Family adaptability was more important in determining parental involvement than was family cohesion. Families more balanced in the area of adaptability (that is, structured or flexible) were more likely to be highly involved than were less balanced families (those more rigid or chaotic).

Nominal variables were compared using a Chi-Square test of independence. and by maternal employment. Involvement was found to be unaffected by the ethnic status of the child [X^2 (3) = 3.02, *p* = .388], whether the child was first or later born, [X^2 (3) = 5.20, *p* = .158], the occupational status of the mother [X^2 (3) = 3.26, *p* = .353], or whether or not the mother worked [X^2 (3) = 5.40, *p* = .145]. However, occupational status of the father was important in that higher status was related to higher involvement [X^2 (3) = 37.08, p = .000],. Single parents [X^2 (3) = 18.60, p = .000], and those on public assistance [X^2 (3) = 18.94, p = .000] were less involved overall.

Significant variables were entered into a stepwise multiple regression equation in which parental involvement was the dependent variable (see Table III.12). The best predictors of parental involvement were found to be the education of the mother, family income, total family support, and the FACES total score. Together, these variables accounted for approximately 37% of the variance. All variables were positively related to parental involvement with the exception of the FACES total. Since higher scores indicate less balance in the family, the negative relationship between parental involvement and the FACES total is as would be expected--more balanced families are more likely to be highly involved.

Table III.12
Multiple Regression Table Depicting
Predictors of Parental Involvement

Variable	B	R^2
Education of mother	.290	.2279
Income	.179	.2899
Family support-total	.048	.3445
FACES total	-.035	.3719
Constant	.963	

Thus, where the mother has a higher level of education, the family has a higher income and level of support, and the type of family functioning is balanced rather than extreme, higher levels of parental involvement in the child's education can be predicted. Variables such as maternal employment or perceived amount of time available in the family were found to be unimportant.

These results indicate that those who are highest in parental involvement may be those least in need of help for their children. Special efforts may be needed to involve those parents who are lower in terms of resources and support. Or, programs may need to ameliorate those needs if they wish to increase parental involvement. Determination of the specific areas in which these parents are most likely to benefit may yield great value in providing effective intervention for young handicapped children.

Measuring Parent Involvement

Purpose/Rationale

Early intervention has been placing increasingly more emphasis on the role of parents in providing services for young handicapped children. The theoretical basis for encouraging parent involvement is sound. First, parents have the most persevering relationship with the child, and may ultimately have the most dramatic impact on the child's development. Therefore, it is logical that training focus on providing parents with the skills needed to provide appropriate intervention. Secondly, the impact of a handicapped child on family members has recently been received a great deal of attention. Parent involvement may also benefit family functioning by providing parents with strategies to cope with their child's handicap, thus ameliorating negative factors such as stress, child abuse, lack of support or resources (Bailey & Simeonsson, 1986).

Although the field strongly believes that parental involvement is an important mediating variable in early intervention, studies purporting the benefits of parent involvement have lacked the data needed to verify the actual degree of parent involvement (Casto & Lewis, 1984).

In an effort to provide the field of early intervention with information regarding parent involvement, EIRI has developed and implemented various strategies for measuring this variable. These methods are described below.

Several strategies were implemented in an attempt to measure the amount of time parents spend working with the child at home as well as time spent with program staff. These methods and their degrees of success follow:

> Attendance Data. Across all sites pertinent attendance data was collected not only on the child but also the parent. Interventions involving regular parent meetings and/or those programs offering optional activities (e.g., Father's Day classes, counseling) kept consistent attendance data recording the date and the duration of the session. Such information has generally been easy to obtain since programs routinely collect such data. Attendance at mandatory and optional sessions are reflective of parent involvement.
>
> Postcard System. Postcards were sent to parents, requesting answers to the following questions: 1) How much time during the week did you, as a parent, spend working with a staff member doing program related activities, such as home visits, parent groups, or time at the center? 2) Working without a staff member present, doing structured learning activities that were suggested by program staff? Detailed directions and examples were enclosed with the initial postcard (see example 1). The postcards were pre-addressed and stamped. Initially, postcards were requested to be completed each week of the intervention, and educational toys were offered as incentives for completing 10 cards. However, analysis of return rate have shown that less than 50% of cards mailed on a weekly basis are returned. A more complete data set has proven likely if parents are requested to complete only 3-4 cards per year. Phone interviews can then be used to obtain these data from families who did not return the postcards.
>
> Data Charts. Some EIRI sites require the parents to record program data as an integral part of the treatment. This information can then be used to document parent involvement. One such method involved sending a calendar home each month, requesting that parents record the frequency or amount of time spent tutoring/training their child at home. Another method utilized a data sheet on which parents recorded similar information.

One problem with obtaining such information through written correspondence is the potential for misunderstanding in regard to the intended information. For example, this method of data collection was used in a study comparing a traditional center-based control group with an experimental group which received a parent training component in addition to the center-based program. In reviewing the responses, it appeared that the parents in the experimental group limited their responses to reflect only what was required of them through the parent meetings, at the exclusion of their other program-related contracts (i.e., meetings with their child's teacher, IEP meetings, etc.) Unfortunately, it is often difficult to correct this misinformation given the latency period between the parent's completion of the card and the actual recording by the site.

Time Estimates via Personal Interview. To ensure that parents correctly understood the request for an estimate of time spent working with their child at home, personal interviews were used at other sites. These interviews were conducted by the intervenors during home visits, generally once per month. This method is also more reliable in regard to collecting all the needed data points.

There are positive and negative aspects of using intervenors to conduct the interviews. On the positive side, parents typically are more comfortable responding to someone they know well, opposed to talking with a naive interviewer. Additionally, the intervenors, based on their knowledge of the parent, can verify the accuracy of the parent's response. However, the use of intervenors can also be considered a threat to the honesty of the parental response. A parent may overestimate the amount of time spent working with their child at home to meet the expectations of the intervenor. The intervenor's rating of the accuracy of parent report may also reflect possible bias toward particular families.

The use of third-party interviewers has also been employed as a means of obtaining estimates of parent time. One project collected time estimates via phone calls made by EIRI staff who were naive to the subject assignment. Third-party reviewers are useful in preventing possible bias toward the interviewer, and therefore, these results may be considered more objective. Third-party reviewers who are sensitive to the culture of the families as well as to the feelings of parents with handicapped children should be selected. This will help alleviate possible inhibition on the part of the parent, resulting in more accurate responses.

Descriptive Information. In addition to time estimates, many sites have requested that parents specify the kinds of activities or goals being worked on at home and at school (see example 2). Such information clarifies the time estimates. For example, a parent who is working on feeding skills at every meal would record a greater time estimate compared to a parent who was working on a skill such as buttoning. Such descriptive information also reflects the parent's knowledge of the child's program goals as decided by the team, which also lends validity to the data.

Quantitative systems such as those previously described lend themselves to teaching situations that are conducted in a discrete-trial fashion. For example, the CAMS curriculum used in the IVH studies states specific procedures, number of trials, and materials to be used in teaching a skill. The parent intervention offered in the New York study provides instruction to parents in how to implement various programs requiring mass trials such as compliance training. Such instructional procedures can easily be measured by recording the number of trials administered or the amount of time spent in the tutoring session.

Although such programmed instruction is a useful instructional strategy for acquiring many skills, early intervention programs often emphasize a more naturalistic approach to intervention whereby instructional opportunities are integrated into the daily routine rather than taught within a specific time period. For example, a child's goal may be to imitate the parent's vocalizations. Rather than suggest that the parent work on this goal once per day for 10 minutes, the intervenor may offer suggestions as to how to encourage vocalizations during feeding, bathing, and play times. Such incidental teaching strategies demand that the parent be attentive to the child's goals throughout the day, requiring equally as much effort on the part of the parent's time as a discrete-trial approach to instruction.

The difficulty lies in quantitatively measuring the degree to which the parent implements the suggested program activities. Individual "trials" are implemented numerous times throughout the day, and they are difficult to count much less note the time spent on specific opportunities. Therefore, the collection of such quantitative data at sites that emphasize a naturalistic philosophy toward instruction has proved unsuccessful. Alternative qualitative methods have resulted.

Ratings of Instructional Strategies. The parents in the home-based intervention group are provided with instructional strategies that can be integrated into the parent and child's daily routine, thus making it difficult to quantitatively measure the amount of time the parent spends working with the child at home. To obtain information about the parent's level of involvement, a rating system to be completed by the home intervenor was devised (see example 3). Nine questions describing characteristics considered important for parent involvement and instructional carry-over to the home are rated using a 5-point Likert-type scale. Since the control group involves only twice-monthly group meetings, there are no intervenors who work individually with the parents. Therefore, the rating scale is completed for parents only in the high intensity group, not those in the low intensity group.

Ranking of Parent Involvement. In addition to having the intervenors estimate the amount of time they perceive the parent to have spent instructing the child at home, intervenors were also asked to rank order the parents from highest to lowest according to the amount of time spent with the child doing speech-related activities, the quality of this time, the overall stress/tension level in the home, and the level of cooperation with the program.

Description of Parent Activities. This form is completed once per year, usually at posttesting time, for each parent whose child is a subject in an EIRI research study. The direct intervenor who works closely with each parent rates the parent using a 3-point scale on four quality indicators: attendance, knowledge, cooperation, education of the child (see example 4).

The feasibility of collecting information via ratings/rankings has been proven to be easily obtained; intervenors typically are able to complete the ratings with confidence and in a minimal amount of time. Unfortunately, ratings often cannot be obtained for EIRI studies which involve control groups that do not receive individualized intervention. Therefore, these ratings cannot be used to make group comparisons, but only to assess differences within the treatment group.

The major problem in using such rating systems involves the questionable validity of the results. Although the intervenors may know the parents well, their ratings are still subject to personal biases they may have toward the parents. When comparisons have been made between quantitative responses obtained from parents and qualitative ratings from intervenors, the resulting correlations were generally low. Therefore, it is difficult to objectively state which estimate of parental involvement is accurate.

Recommendations for Collecting Parent Involvement Data

The following suggestions are made based on what EIRI investigators have learned from attempts to collect parent involvement data:

1. Quantitative estimates of time are most useful for programs emphasizing a systematic, direct instruction approach to intervention.
2. Information can be obtained more consistently through personal interview rather than via written correspondence, and it reduces the risk of misinterpretation on the part of the parent and staff.
3. Data can be obtained more willingly if it is collected at various intervals (e.g., 2-4 times per year, as opposed to weekly or monthly).
4. Parents appear to be more responsive when contacted by someone affiliated with their child's program (yet naive to the study) or by someone from the local area. Contacts by a third-party (i.e., at the national study level) often go ignored or cause the parent confusion.
5. If possible, use triangulation procedures to assess parental involvement, obtaining estimates from several sources. Parents should have an opportunity to self-report their involvement in the program in addition to obtaining the intervenor's estimates.

The results of EIRI's attempts to measure parent involvement suggest that parent involvement continues to be very difficult to assess objectively. However, extensive analyses which may shed light on the value of both the quantitative and qualitative data are in the process of being conducted. For example, comparisons between parental report of time spent working with the child and changes in the child's pre- and posttest scores may prove interesting. The relationship between parent report of time and family variables such as stress may also provide insight into the relationship between these two variables. Therefore, although the validity of the described systems have not been proven empirically, efforts to collect this valuable information will continue.

Costs of Early Intervention: A Summary

In this section, we consider what may be learned by bringing together all of the information on costs of early intervention provided by the Institute's studies. This information is summarized in Table III.13, with programs categorized according to whether they are one-to-one home- or center-based programs, or group

Table III.13

Overview of Program Costs

		Number of Children	Cost Per Child	Cost Per Child w/Volunteers	Direct Service as % of Total Cost	Caseload/Teacher-Child Ratio	Hours/Year	Cost/Hour	Cost/Hour (with Volunteers)
One-to-One Home- or Center-Based Programs									
SC IVH		20	$ 4,259	$ 5,812	.52	4 - 5	24	$146.50	$242.17
LSU IVH		13	10,804	11,378	.54	2	46	234.87	247.35
SLC IVH	Early	20	1,983	3,474	.73	10	24	82.63	144.75
	Delayed	49	830	1,669	.79	25	12	69.17	139.08
LSU VI		15	6,292	6,962	.50	2	46	136.78	151.35
Sunshine	High Intensity	27	7,252	8,715	.53	7 - 8	120	60.43	72.63
	Low Intensity	36	3,626	4,510	.53	7 - 8	60	60.43	75.17
PITCH (Home Visit)		20	2,287	2,973	.77	10	12	190,58	247.75
Baton Rouge		24	9,448	10,070	.56	5	48	196.83	209.79
SMA	Once/week	170	4,119	4,119	.60	15	36.5	112.85	112.85
	3x/week	9	10,903	10,903	.77	15	96.0	113.57	113.57
Lake McHenry	Once/week	216	2,687	2,689	.59	18	36.5	73.62	73.67
	3x/week	15	7,163	7,168	.70	18	96.0	74.61	74.67
Group Center-Based Programs									
Arkansas		69	3,257	5,424	.74	1:4	321	10.15	16.90
Des Moines*		210	5,860	5,860	.64	1:6	540	10.85	10.85
New York*		121	18,005	19,624	.37	1:3.5	540	33.34	36.34
DDI*		174	4,140	5,893	.68	1:4	540	7.66	10.91

* Does not include cost of experimental parent training program.

center-based programs. The one-to-one program's work have staff work with each child individually, sometimes with the parent. Most of the one-to-one programs are home-visit programs in which the staff member travels to the child's home. The SMA and Lake McHenry programs are exceptions in that the child must be brought into a center to receive the intervention. However, many of the home-visit programs allow children to come to a center to receive service if this is more convenient for the parents or to receive specific types of therapy. In at least one home visit program (Baton Rouge), there were more visits to the center than to the home.

Two cost-per-child figures are given in Table III.13. The first cost figure includes only the actual expenditures for the program (even if these were made by another agency, as in the case of "borrowed" facilities). It is what people commonly think of when they think about program costs. The second cost figure includes the opportunity costs to parents of the time they contribute to the program by providing transportation, participating in home visits, and participating in other program activities. The calculation of parent costs has been discussed in an earlier section of this report. This second cost figure is what economists would call the total social cost of the programs.

In some of the studies (Baton Rouge, New York, Salt Lake DDI, and Des Moines), center-based programs were compared with and without an add-on parent training program. These studies are noted with an asterisk in Table III.13. In order to make the table easier to follow, only the cost of these programs without the add-on parent program is presented. To this point, none of the studies offers any strong evidence that the add-on contributed to improved outcomes, so that we considered them superfluous to the programs we studied. It is worth noting that, based on our studies, programs that considered adding a parent program of similar magnitude (though perhaps differently designed) could expect to spend between $500 and $1,000 per child on such a program.

As can be seen, there was wide variation in the estimated costs of the early intervention programs that we studied. This variation covers the full range of costs one would expect to see in early intervention. Considering just out-of-pocket (the first figure), one-to-one programs ranged in costs from $830 to $9,500 with the programs with a home-visit focus less expensive than those requiring visits to a center. Considering parent costs as well, the cost estimates are $1,700 to $10,500 for one-to-one programs. The costs of group center-based programs ranged from $3,300 to $18,000 without parents' opportunity costs and from $5,400 to $19,700 with them. There is obviously a substantial overlap in the cost figures between the types of programs. It is clear that home visit and other one-to-one programs can be less expensive than center-based programs, but are not necessarily less expensive.

Given the amount of variation present in the cost of the programs we studied, it is worth seeing what factors can be identified that might systematically explain some of the differences among the programs. Undoubtedly, some of the variations in costs is due to purely local differences and incidental program idiosyncracies. However, we believe that a substantial amount of the variation in cost is due to differences among programs that are matters of choice. Four program characteristics have been identified that appear to significantly influence program cost: duration, intensity, number of services, and reliance on parents to bear part of the costs.

Cost and duration of services. One source of variation in the cost of these early intervention programs is variation in the duration of intervention services. Programs that serve children in group settings vary in the length of day and number of days per year. All of the group center-based programs studied were "half-day" programs and varied relatively little in hours per day. For group programs, generally the number of days per year may reflect a school year or year-round program. In the Institute's studies, all of the group programs operated for a school year. However, the Arkansas programs met fewer days per week, leading to fewer total hours. Programs that serve children through home visitors vary in the length of visits and the number of visits per year. For studies reporting duration, the planned number of hours per year varied from 260 to 540 for center-based programs and from 24 to 120 for home-based programs. We say "planned" because in both types of programs there is some absenteeism, so that actual hours of service tend to be less. For example, in the Sunshine program, the "high intensity" group was targeted to obtain 120 hours of service, but actually they only obtained 92 hours. In the Des Moines program, the total possible hours was 540, but actual attendance resulted in an average of 390 hours of service.

The cost-per-hour figures in Table III.13 indicate the relative costs of programs holding duration constant. One seemingly obvious conclusion is that home visit programs provide many fewer hours of service at a much higher cost per hour of service. However, it must be cautioned that only the home visitor's time is included. If the intent of the program is to enable parents to deliver intervention services (in a formal program or through natural interaction), the actual hours of intervention may be somewhat underestimated. However, in this case, the primary goal of these programs was to directly deliver service and not to train parents to be intervenors. As best we can tell, parents provided relatively little in the way of intervention.

One aspect of duration that is not captured in Table III.13 is the number of years of intervention that may be required. Two years of a program costs twice as much as 1 year. Programs that begin at birth and continue until school entry can be expected to cost much more than programs that begin at ages 2 or 3. The explicit question that the age-at-start studies address is when to start intervention.

Cost and intensity of services. Variation in the intensity of services is another important source of variation in the cost of early intervention and the primary reason that cost per hour of service is so highly variable. One way to define program intensity, which may also be considered as the quality of service delivered in a given period of time, is by the number of direct service staff and their qualifications. As staff account for about 70% of program costs (Kakalik, Furry, Thomas, & Carney, 1981; Coelen, Glantz, & Calore, 1979; Ruopp, Travers, Glantz, Coelen, 1979), substantial increases in program intensity imply substantial increases in program cost. Measures of intensity are provided by the caseload and staff-child ratio. These vary considerably across the Institute's programs. Although there is not a simple direct relationship, it can be seen that intensity does have an appreciable influence on costs.

In the larger world of early intervention, program intensity tends to vary with the characteristics of the children served. The two most important characteristics in this respect are age and the type and severity of handicapping condition. Younger children and more severely handicapped children require higher staff-child ratios. This is not particularly true for the Institute's programs. These programs are, after all, a small and nonrandom sample. However, it does suggest that there may be other influences on cost, which will be discussed later, that are more important than child characteristics in determining cost per child.

Clearly, there is a very strong difference between most center-based programs and home visitor programs with respect to intensity. Home visitor programs all have a staff-child ratio (or staff-parent ratio) of 1 to 1. (There are a few center-based programs like SMA and LMH that have children brought to the center for one-to-one sessions). As this ratio is constant for home visitor programs, these tend to make the most economic sense for infants and severely handicapped children who require the most intense services. At the same time, the intensity of home visits makes the cost per hour very high. Thus, home visitor programs tend to provide relatively few hours of care in order to keep cost down.

The cost estimates presented in Table III.13 cover the range of likely policy options but should not be considered to estimate the average cost of early intervention programs. This is a small and unrepresentative sample in which some of the programs were specially designed for our research projects. Some have unusually high staff-child ratios and exceptionally qualified (and well paid) staff.

Cost and number of services. Other things being equal, programs that provide more services are more costly than those that are more limited. Thus, early intervention programs that provide classroom services for children and home visit services for children and/or parents tend to cost more than programs that deliver only one or the other of these options. We indicated earlier that an add-on program for parents of children attending a center-based program cost about $500 to $1,000. One cost area that is mundane, but deserves to receive more attention, is transportation. Home-visit programs bear all of the costs of transportation, including not only the out-of-pocket costs but the time costs to parent and child that are incurred if a child must be transported to a center. As every parent knows, it may be very "costly" to get everything together to take an infant to meet an appointment. When programs do provide transportation to a center, this can be very expensive. At the New York site, transportation accounts for $9,000 per child per year, almost half of the total cost.

Costs to parents. The costs of programs may appear to vary because parents bear some of the costs. The two cost estimates in Table III.13 can be compared to identify the portion of costs borne by parents in addition to the costs borne by the public. Often, parents are used in the roles of intervenors at home or in classrooms, in other volunteer roles, or as providers of transportation for their children. The opportunity cost to parents of the time consumed by these activities is frequently overlooked, and the omission of this cost causes some programs to appear more economical than they are in reality. For example, estimated costs to parents amount to more than $1,000 per child for most of the programs in either one-to-one or center-based categories. The primary source of this cost is providing transportation. The Des Moines and Salt Lake DDI sites provide almost exactly the same services to very similar children. Because Des Moines provides transportation, it appears to be more expensive despite a higher student-teacher ratio. When parent costs are added to DDI, this picture changes.

Home-based programs (and one-to-one short sessions in a center) can be thought of as reducing cost per child by separating child development services from child care services and focusing resources on the former. The cost of child care is then "shifted" to the parents, resulting in a program that costs the taxpayer less. Programs that provide early intervention services in center-based (and even in ordinary day care settings; see Weiss, 1981, and Rule et al., 1987) can provide an additional benefit to families that offsets some of the cost.

From a legal perspective, the 1987 amendments to the Education of the Handicapped Act (P.L. 99-457) require that a "free appropriate education" be provided to handicapped 3- to 5-year-old children. In the past, this has been interpreted to mean that parents of handicapped children should not pay out-of-pocket costs or be required to provide their own transportation, but the opportunity costs of parent time have been largely ignored. We suggest that this is inconsistent. Regardless of how parents choose to spend their time (in the labor force, caring for children at home, in active or passive leisure, etc.), their time has value, and if they are required to give it up, they incur cost. As we have argued elsewhere, the economic value of a parent's time is, at the very least, what they could earn if they chose to be in the labor force (Barnett, Escobar, & Ravsten, in press).

Costs of Transportation

We believe that the cost of transportation is an issue that may be receiving increased attention in the near future. Prior to the passage of P.L. 99-457, center-based programs for young handicapped children often relied on parents to provide transportation. Now, center-based programs at least must provide the transportation, but the cost may turn out to be fairly high. We have no way of estimating national costs, but we are concerned by the high transportation costs in some of the Institute's programs. A study we conducted in Utah found a range of $400 to $2,000 per child for one school year, with a significant number of programs reporting costs toward the high end (Escobar, Peterson, Lauritzen, & Barnett, 1987). Utah is a relatively low-cost state, and transportation costs may well be higher elsewhere. Given the magnitude of these costs, a search for ways to reduce transportation costs may be a high priority. For example, from our calculations, it appears that paying parents the value of their time to provide transportation for their children could be substantially more economically efficient than having programs provide transportation.

Costs and Economic Efficiency

In our discussion up to now, we have implicitly assumed that the programs we have studied are at least approximately efficient. This means that (a) they come close to producing the best program they can with the resources available, and (b) they are not spending much more per child than can be justified by the program's outcomes. Of course, the first is not necessarily true, and the lack of information regarding the second is the reason we are conducting cost-effectiveness and cost-benefit analyses.

One way of looking at the first aspect of efficiency is to see how much of the program budget is devoted to direct service. In the programs we studied, this varied from less than 40% to more than 80%. In the extreme low case, this is accounted for by the very high cost of transportation in that program. Overall, it appears that one-to-one programs devote a larger portion of their budget to administration and other nonservice costs. Again, there is an exception. The SLC-IVH program indicates that home visitor programs can push efficiency to the upper limit. As would be expected, programs that spend a higher percentage of their resources on direct service (more efficient programs) have lower costs per child.

In a few cases, the costs of the program by themselves provide some information regarding the second aspect of efficiency. We studied three different IVH programs with three very different costs. In part, this is accounted for by differences in hours of service. However, there was also a large variation in the cost per hour of service with the other programs three to five times as costly as the least expensive. A major reason for this is the variation in caseload across sites. Similarly, across the center-based programs, the severity of children's handicapping conditions varies relatively little. However, cost and staff-child ratio vary substantially. Although direct comparisons across sites cannot be made with the same confidence as within site comparisons, the evidence we have does not suggest that the large differences in costs and intensity produced meaningful differences in child outcomes. This conclusion is consistent with the "revenue theory of costs" that has been observed to apply to other educational programs (Bowen, 1980).

The revenue theory of costs essentially holds that how much is spent on a program is determined by how much money is available, with cost per child a function of the number of children to be served. The reason for this is that there is no notion of the appropriate or maximum level/quality of service: how much service each child receives is determined by rationing all available resources. This type of operation conflicts with the economists' expectation that the benefits from each increment in spending decline as spending increases, and that at some point additions to spending do not yield sufficient benefits to justify them (eventually, additional spending yields no benefits at all).

An Evaluation of the Usefulness of the Battelle Developmental Inventory for Making Special Education Eligibility and Placement Decisions

Iplementation of P.L. 99-457 requires identification of appropriate instruents for use in making eligibility and placement decisions for infants, toddlers, and preschool children. One test which has been recommended for this purpose is the Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984). This section provides a review of the technical characteristics of the BDI which would support its use for this purpose. Information presented in the test manual on standardization, reliability, and validity of the BDI suggest that, although the test appears to be appropriate as a criterion-referenced measure, its use as a normative measure for purposes of making eligibility and placement decisions is not supported.

Public Law 99-457, the Education of the Handicapped Act Amendments of 1986, has been an impetus to the expansion of early intervention programs for young children with handicaps. A major challenge which accompanies the implementation of this law is the identification and assessment of children who are eligible for services. This challenge in determining service eligibility is made more difficult as the result of the psychometric inadequacies which plague the norm-referenced assessment devices which are available for use with infants, toddlers, and preschool children (Brooks-Gunn & Lewis, 1983; Schakel, 1986; Shonkoff, 1983). Inadequate standardization, reliability, and validity are problems which are frequently associated with preschool assessment instruments. For this reason, tests for use with this population must be evaluated critically to determine the extent to which they meet minimal criteria for technical adequacy (Bracken, 1987).

One of the newer instruments which can be used in the assessment of infants and young children is the BDI. The BDI is described by its authors as an instrument with both norm-referenced and criterion-referenced characteristics which can be used to assess children from birth to eight years of age across five developmental areas: Adaptive, personal-social, communication, motor, and cognitive. The availability of an instrument which can be used for both determination of program eligibility as well as for purposes of IEP development is clearly welcome given the particular importance of linking assessment and intervention with this population (Paget & Nagle, 1986).

Although the BDI has increased in popularity as an assessment tool, particularly as a result of its combination of norm-referenced and criterion-referenced characteristics, there is increasing evidence that caution should be used when using this test for making eligibility and placement decisions. Bracken (1987) noted that while the manual for the BDI presents adequate data on test-retest reliability, there are a number of weaknesses in the comprehensiveness of the reliability and validity data presented. Bailey, Vandiviere, Dellinger, and Munn (1987) have also noted difficulty in obtaining high levels of scoring accuracy and the problem of obtaining negative developmental quotients when the extreme standard score procedures are used.

Although Bracken (1987) and Bailey et al. (1987) have provided some preliminary evaluations of the technical adequacy of the BDI, a more comprehensive review of the psychometric data presented in the test manual has yet to be presented. Such a review would provide important information about the usefulness of the BDI in making eligibility and placement decisions for preschool children. It is the purpose of this section to present such a review, which will include an examination of the data presented in the BDI Examiner's Manual on the test's standardization, reliability, and validity. A discussion of the extent to which the psychometric data presented for this test support its usefulness in making eligibility and placement decisions will follow.

Standardization

The BDI was standardized on a sample of 800 children, 100 at each one-year age level. Four geographical regions and their subregions were selected to approximate characteristics of the U.S. population by community size and urban/rural characteristics. This resulted in the identification of 28 test sites in 24 states. Within each test site, test administrators were assigned quotas that specified the age, sex, and race of the children to be tested. No control for SES was made, although the test developers note that, "Test administrators selected children from a wide socioeconomic status (SES) spectrum with an emphasis on middle SES" (Newborg et al., 1984, p. 49).

The test administrators were, "Selected to represent different degrees of training in and/or familiarity with assessment procedures and uses: (Newborg et al., 1984, p. 49). The test administrators thus included professionals as well as paraprofessionals; however, a description of the extent to which these test administrators received training and supervision is not provided.

The standardization of the BDI is adequate in terms of the representativeness of the sample, as the final standardization sample closely approximated the U.S. population in terms of males and females and Whites and minorities. However, the extent to which the sample contained an adequate number of subjects at each age level is open to question. Although 100 children at each age level is sufficient for the school-age portion of the sample, the wide variability in the development of young children would suggest the need for more than 100 subjects at each one-year interval in the younger age ranges. For example, standardization of the Bayley Scales of Infant Development (Bayley, 1969) involved a sample of 1,262 children between 2 and 30 months of age. From a comparative standpoint, the BDI sample size of 301 children between birth and 35 months of age may not be adequate.

The problem of sample size is most evident in the normative tables presented i the test manuals. For children up to 23 months of age, six-month age spans are used to transform raw scores to percentile ranks; after 23 months, age spans of 12 months are used. Thus, percentile ranks for a child who is 24 months of age would be determined by comparing his/her raw score to the table which is based on a sample of 100 children between 24 and 35 months of age. This clearly leads to a lack of precision in determining the child's standard score (which is based on the percentile rank).

Another aspect of the standardization process which deserves comment is the testing procedures used during standardization. The ability to use the normative data for a test is related to the extent to which users test under similar conditions and use the same verbal instructions and materials as those used during standardization. However, this does not appear to be possible with the BDI for a number of reasons. First, the test allows for three possible administration formats, depending on the item: structured item administration, report by the caregiver, or direct observation of the child. For some test items, only one administration format is permitted; for others, two or even three administration formats can be used. Given the possibility that test items might be scored under a number of different conditions, it would be important to know the extent to which these assessment formats were used in the standardization sample. However, no data to this effect are presented in the manual.

A second difficulty relates to the materials used for structured item administration. Until recently, there were no standardized materials available for use with the test manuals. When a materials kit was developed, the quality of many of the toys was poor. Due to numerous complaints from users, the test publisher has made numerous improvements in the test materials. While this is admirable, it is clear that the test materials which are now in use are not identical to those used during the test's standardization.

Reliability

The test manual presents data on the standard error of measurement, test-retest, and interrater reliability by age for each domain and subdomain of the BDI. Each of these aspects of the test's reliability are discussed below.

Standard Error of Measurement

A review of Table 7-1 in the examiner's manual indicates that the standard errors of measurement for the test are quite small, suggesting good stability of scores. However, upon reviewing the description of the procedures utilized to determine the SEM, a discrepancy is noted. Although the standard error of measurement is referred to throughout the manual's narrative and in the tables, the description of the calculation of the SEM is actually the formula for determining the standard error of the mean: "The standard errors of measurement were calculated by dividing the standard deviation by the square root of the sample size of the appropriate age group" (Newborg et al., 1984, p. 52). Recalculation indicates that the values presented in Table 7 in the manual as the standard errors of measurement are actually standard errors of the mean. Although the actual SEM can be calculated using the standard deviations presented in Table 7 in conjunction with the reliability data presented in a later portion of the manual, this error clearly results in misleading information.

Test-Retest Reliability

Test-retest reliability was determined by retesting 183 children within four weeks of their original test. These children included those from the standardization sample as well as those from a sample of children with a range of handicapping conditions; the proportion of subjects from each group is not specified. Although the manual states that approximate numbers from each age group were tested, actual number of subjects by age group is not presented. Also, there is no indication of the specific scores used to determine test-retest--i.e., the test can yield percentile ranks as well as a range of standard scores, including z, t, DQ, and NCE. Age equivalents can also be computed. Ideally, the means and standard deviations for the first and second testings should be presented in the manual.

The manual presents an overall test-retest reliability coefficient of .99 for the total sample, and .88 for what the manual terms "item by item" reliability.

The procedures used to determine these two different coefficients are unspecified. Test-retest reliability coefficients for the total BDI score by age group range from .90 (72-83 months) to .99 (6-11 months, 12-17 months, 24-35 months, and 36-47 months). These coefficients are admirable, indeed, ideal. However, the lack of sufficient information regarding their calculation is disturbing, particularly in light of the fact that these coefficients are significantly higher than those reported for other tests commonly used with this population. For example, for the Bayley Scales of Infant Development (Bayley, 1969), the average item-by-item agreement on the Mental Scale after a one-week test-retest interval for 28 eight-month-old infants is 76.4 (Bayley, 1969); one-month test-retest coefficients for the General Cognitive Index (GCI) for the McCarthy Scales of Children's Abilities (McCarthy, 1972) were .91 for 3 to 3-1/2 year olds, .89 for 5 to 5-1/2 year olds, and .90 for 7-1/2 to 8-1/2 year olds (McCarthy, 1972); after a mean retest interval of approximately 11 weeks, the test-retest coefficient for a group of 50 children between 5-1/2 and 5-3/4 years of age was .92 for the full-scale IQ on the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) (Wechsler, 1967). Although these tests differ on a number of dimensions, the authors of the BDI would do well to support their presentation of reliability data with additional information so that comparisons to other tests can be made.

Interrater Reliability

Interrater reliability was assessed by having second raters score a test administration with 148 children in the norming sample as well as a sample of children with a range of handicapping conditions. The coefficients for the BDI total score by age group were again extremely high, ranging from .93 (72-83 months) to .99 (18-23 months, and 36-47 months). Again, the manual indicates that there were approximately equal numbers of children in each age group, but neither the actual number of children nor the proportion of subjects from the norming and handicapped samples are presented. The interrater reliability coefficients are presented in the same table as those for the test-retest coefficients, and the same criticisms regarding lack of specific information regarding the procedures for their determination apply.

Validity

The manual contains information regarding the content, construct, and criterion-related validity of the BDI.

Content Validity

The manual indicates that the content validity of the BDI was ensured through the development process, which included the use of experts to develop and evaluate the selection of test items. A review of the BDI items suggests that the test is adequately covering the content areas included, and items appear to be placed appropriately within age levels.

Construct Validity

Correlations between BDI component scores are presented, and a factor analysis of the pilot data is described as evidence for the construct validity of the BDI. The specific scores used in the intercorrelations in Table 7-3 of the manual are again unspecified, and the table does not include the intercorrelation between the Cognitive Domain total score and the BDI total score. Intercorrelations between the other BDI domains and the BDI total score are .98 for the Personal-Social domain and .99 for the Adaptive, Communication, and Cognitive domains. The data which are presented do appear to support the authors' contention that a normally developing child who performs well in one domain should perform well in all domains and subdomains.

The data from the factor analytic study of the pilot data (Newman & Guidubaldi, no date) are described. This study suggested that the factor structure of the scale differs depending upon the age of the child, with the largest number of factors appearing for children over age six. However, for children between 2 and 5, five factors, consistent with the BDI subdomains, emerge. These data do provide support for the construct validity of the BDI; however, they are based on the pilot data, and thus the extent to which the final version of the test would perform similarly is unknown.

The manual also presents data on comparisons of the performance of adjacent age groups to support the developmental nature of the BDI. Although there are statistically significant differences between most of the age groups, this analysis did not take into account the fact that there were also different numbers of items for each age group. Based on the gross age groupings used, it is not unexpected that significant differences between age groups were found.

Criterion-Related Validity

The BDI manual presents concurrent validity coefficients between the 10 BDI component scores and the Vineland Social Maturity Scale (Doll, 1965), Developmental Activities Screening Inventory (DASI) (Duboise & Langley, 1977), Stanford-Binet Intelligence Scale (SB) (Terman & Merrill, 1960), Wechsler Intelligence Scale for Children--Revised (WISC-R) (Wechsler, 1974), and the Peabody Picture Vocabulary Test--Revised (PPVT-R) (Dunn & Dunn, 1981) for children in the handicapped sample. Although the authors note that the pattern of correlations support the concurrent validity of the BDI, these correlations are based on an extremely small sample of children (37 for the Vineland, 36 for the DASI, 23 for the Stanford-Binet, 13 for the WISC-R, and 15 for the PPVT-R). In addition, questions can be raised regarding the criterion measures utilized. For example, the Vineland and SB have all undergone revisions due to outdated norms, and the WISC-R would only be an appropriate criterion measure for the very oldest (6-1/2 to 8 years) portion of the normative sample. These data thus represent at best very weak support for the concurrent validity of the BDI.

Subsequent studies have, however, provided additional support for the concurrent validity of the BDI. The domain and subdomain scores of the BDI have been found to correlate significantly with a number of different measures for samples of young handicapped children (McLean, McCormick, Bruder, & Burdg, 1987; Mott, 1987; Pezzino, Mott, & Waidler, 1986). Further research is, nevertheless, necessary to provide adequate support for concurrent validity.

Discussion

The Battelle Developmental Inventory is a test which has a number of characteristics which make it an attractive instrument for the assessment of infants, toddlers, and preschool children. The test covers a relatively large age span, which is advantageous in follow-up assessments of young children, and assesses child skills across important domains of functioning. The focus and sequence of the items within domains also allows for the use of the test in program planning and evaluation of child progress, while normative data are provided to allow for use of the test in making eligibility and placement decisions.

However, despite these positive features, the present review of the psychometric adequacy of the BDI suggests users should exercise extreme caution in using the normative data presented in the test manual for the stated purpose of making eligibility and placement decisions for special education. Although accurate assessment of the skills and abilities of young children is inherently difficult, the procedures used to standardize the BDI as well as the reliability and validity data presented in the test manual suggest that users cannot be confident of the accuracy of the standard scores which children earn in this test.

Although the standardization sample is representative of the U.S. population in terms of sex and ethnic background, sample size was inadequate at the younger age levels of the test. The extent to which specific procedures and materials were used during the standardization process also brings into question the conditions under which the normative data might be applicable.

The test-retest and interrater reliability data presented in the test manual are admirable. However, a lack of specific information on the number of subjects tested within each age group, as well as the specific scores and procedures used to calculate the reliability coefficients, precludes comparisons with other tests commonly used with this population. Information on the test's internal consistency, which would also have aided comparative efforts, is not presented. Errors in the calculation of the standard errors of measurement result in misleading information about which users must be aware.

Validity data presented in the test manual are positive, but provide relatively limited support for the test's construct and criterion-related validity. Although subsequent studies have provided additional support for the concurrent validity of the BDI, additional research on the test's validity is needed.

Practical problems in the use of the BDI are encountered when calculating standard scores. For children who achieve percentile ranks above one, and thus who would achieve DQ scores above 65, the accuracy of standard score determination is limited by the gross age groupings utilized in the norms tables. For those children who achieve a percentile rank of one, and thus a DQ score of 65, the use of the extended score tables can result in uninterpretable scores. As described by Bailey et al. (1987), and as noted by this author as well, use of the extended score tables can either result in negative DQ scores or in DQ scores above 65.

In summary, although the Battelle Developmental Inventory has much to recommend it as a criterion-referenced measure for use in planning programs for infants, toddlers, and preschool children, the test has serious technical weaknesses which limit its usefulness as a tool for making eligibility and placement decisions. Limitations in the procedures utilized to standardize the test, lack of information about specific procedures used to determine reliability, and lack of adequate validity data suggest that this test does not meet the levels of technical adequacy required of an instrument which is used to make important decisions about the educational experiences of young children.

IV. THE EARLY INTERVENTION PROGRAM INVENTORY

The contract with the U.S. Department of Education requires EIRI to develop a data collection system that is capable of providing information about existing early intervention programs with respect to program components and costs, demographic information about participating children and families, and the effects of the program outcomes. The system that has been developed (the Early Intervention Program Inventory -- EIPI) is designed for use by local, state, or federal administrative agencies who are responsible for the operation of several early intervention programs. One of the ultimate goals of the EIPI is to establish a data base that can serve as a "bench mark," whereby results from program evaluations can be compared. Potentially, this system will first assist service providers and researchers in determining whether a given program or given type of program is superior to alternative programs, and second, reduce the need for establishing control and comparison groups in future studies of the effects of early intervention. Another important goal of the EIPI is to provide a useful system for identifying trends in current early intervention program practices that can subsequently lead to systematic variations of key program characteristics in early intervention service.

The following section will report on the development of the four portions of the protocol and briefly outline the activities that have been undertaken in its formation. The development of the EIPI will be discussed with respect to the three steps in its development: Preliminary Pilot Testing, Main Field Testing, and Operational Field Testing. Each of the four portions of the protocol will be discussed: Part A: The Description of Programs, which is designed to collect descriptive data on program and client characteristics; Part B: The Description of Children, which is designed to collect demographic data about children and their families; Part C: Description of Program Effects, which is aimed at collecting data on the effects of early intervention programs in terms of specific child performance data; and Part D: Description of Program Costs, which is aimed at identifying and valuing all of the resources used by each early intervention program. Appendix B includes the most recent version of the EIPI, which is the current product of all the pilot field testing.

PROTOCOL DESIGN STRATEGY

Three considerations were important in developing the EIPI. First, the protocol needed to be efficient (i.e., generate useful information without requiring excessive time, given the complex nature of the information being collected). Since teachers and program personnel who would be using the protocol have many constraints on their time and energy, it was important that the completion of the protocol require minimal time. Second, the protocol needed to be simple to use. A program's willingness to use the EIPI would probably be related to start-up time. The feasibility of using the EIPI on a broad basis could depend on how much technical support and assistance is required to complete the protocol. Third, the protocol needed to produce accurate information. A data collection system that is easy and efficient to use would be of no value if it yielded incorrect data. To address the above considerations, development processes unique to each part of the protocol were carefully implemented.

PRELIMINARY PILOT TESTING

Each of the four parts of the EIPI was developed and pilot tested individually, depending on the specific issues associated with each respective part. The following describes the formation and preliminary pilot tests of each portion.

Part A: The Description of Programs

The process of developing Part A of the EIPI required numerous formative stages. The main challenge was determining the level of question specificity that could efficiently and simply produce both accurate and useful results. The initial drafts of Part A were aimed at collecting detailed descriptive data about programs and program participants, with the intention of quantitatively "capturing" the unique nature of each program according to eight areas of programming: setting, instructional groupings, duration and intensity of service delivery, curriculum, staffing patterns, types of services available, family involvement, and philosophical orientation. Subsequently, a set of detailed items, The Description of Programs, was created for the first three of the eight areas. It was determined, however, that the level of detail of the first draft would not produce enough information about the programs to allow them to be grouped for comparative purposes. Additionally, it was determined that the level of detail of the first draft of The Description of Programs was, at face value, inefficient and overly complicated to complete. Because it was necessary to collect data in each of the eight areas, the decision was made to collect several pieces of descriptive data for each of the eight areas in a less detailed manner, which could result in a system for meaningfully classifying and comparing programs.

The formative process that followed was one of re-evaluating each potential question or objective under each descriptive category and determining which questions were most likely to yield data that would be useful in creating meaningful classifications of programs. This process involved several providers of early intervention programs whose comments resulted in a set of questions that would be addressed under each of the eight descriptive categories. Once the questions were agreed upon by the staff and participating service providers, the questions were presented to the Advisory Committee for feedback. The consensus of the advisory committee at that time was that the eight descriptive categories were appropriate, as were the respective questions or objectives being addressed.

The process that followed was one of developing specific items to address the questions or objectives. As groups of these items were compiled, they were informally pilot tested with the service providers (since they were most likely to be the ultimate respondents to the protocol). After a number of revisions, which were the result of the informal pilot testing, each of the eight descriptive sections and their respective items were compiled to form the Description of Programs part of the EIPI.

This version was then formally pilot tested with three early intervention service providers. The purpose of the EIPI was explained to three service providers and they were asked to complete the Description of Programs in the presence of the EIRI staff member responsible for developing the protocol. During this pilot testing, the developer noted any difficulty respondents had in completing any of the items, answered and noted any questions that they had, and followed the completion of the EIPI with a debriefing with the respondents. During the debriefing, the developer asked for any suggestions about making the EIPI more efficient, more simple to complete, and/or more accurate with respect to its proposed purpose. The pilot tests resulted in several revisions of the Description of Programs, leading it to a form ready for the main field testing that would involve 10 early intervention service providers in the state of Utah.

Part B: Description of Children

The process of developing Part B: Description of Children was similar to the process used for developing Part A: Description of Programs. It was determined that Part B should include items pertaining to the following areas: race or ethnic origins, guardianship, parents' employment status, age of children, and type and severity of the child's disability.

The challenge in developing this part was not in determining the question areas, but in determining the most effective way to gather information in each of these areas. A number of item formats were created for each question. These items were informally pilot tested with service providers and other research and evaluation experts before a format for each item was tentatively determined. These items were then compiled to form the child description part of the EIPI. Preliminary pilot testing was conducted simultaneously with, and in the same fashion, as the preliminary pilot test of Part A. When the respondents raised questions or had difficulty with a given item, they were presented with alternative item formats and asked which format was more satisfactory, or if they had any suggestions of their own for improving the format. This portion of the preliminary pilot testing resulted in revisions of the items putting the child description part in a form ready for the main field test.

While the Battelle Developmental Inventory (BDI), which will be used in Part C: Description of Effects, provides useful data pertaining to Personal-Social, Adaptive, Motor, Communication, and Cognitive domains, it does not yield data useful in categorizing visually and/or hearing impaired children. Therefore, the objective of the preliminary field test phase was to determine if indeed the BDI is the best available measure to obtain useful descriptive child data, if another measure would be more useful, and/or if the BDI could be augmented with items pertaining specifically to vision and hearing abilities to make it a more satisfactory measure for descriptive purposes.

Simeonsson's ABILITIES model (in press, which appears in Appendix B) was identified as one possible alternative for obtaining child description data. This model was developed to obtain descriptions of children's functional capacities that would be a useful classification index. It allows group data of children to be summarized in a global and concise manner, according to the functional abilities of the children. The model contains 10 variables reflecting a child's most critical areas of functioning: Audition, Behavior, Intelligence, Limbs (arms and hands), Interpersonal communication, Ionicity, Integrity of physical status, Extremities (legs), and Sight.

While Simeonsson has implied that the ABILITIES model has potential for describing participants in early intervention programs, it has not been systematically field tested. Thus, it was decided to conduct a preliminary field test of the ABILITIES model to determine its reliability, practicality in administration, and its usefulness in describing a sample of children with handicapping conditions, all of which would make it appropriate for use in the child description section of the EIPI.

Three teachers of preschool classes for children with handicapping conditions (with ages ranging from 31 to 62 months and a mean age of 49 months) were asked to complete the ABILITIES model for each of their children and were paid a consultant's fee for their services. Each full-time, experienced teachers taught one class in the morning and one in the afternoon.

After reviewing the ABILITIES form, the three teachers were trained by Dr. Simeonsson to complete the ABILITIES model during a 15-minute teleconferencing training session. During this training, Dr. Simeonsson explained each of the categories on which the children were to be rated, as well as each of the potential response levels and answered any questions.

During a 1-1/2 hour period, the teachers completed the ABILITIES model for each of their children without any of the children present, but with access to the children's records. This required approximately 5 minutes per child. At this time, the teachers were also asked to indicate which of each other's children they knew well enough to complete the ABILITIES model. Subsequently, the teachers performed three additional assessment activities 2 weeks after the first administration of the ABILITIES model. First, to assess test-retest reliability, teachers were asked to complete the ABILITIES model a second time for each of their children (again using any available records that might help them). Second, reliability was also assessed using a scramble and match technique. Each teacher was given a random selection of five completed ABILITIES forms (which were replicas of the protocols from the first administration of the model) without names on them. In addition to the completed protocols, the teachers were given a list of five names of their students. They were then asked to assign names from their list to the appropriate completed ABILITIES form. Third, to assess interrater reliability, the teachers were asked to complete the ABILITIES model for each of the children in each other's classes whom they had indicated as knowing well at the time of the first administration of the model. Additionally, the BDI was individually administered by professionally trained diagnosticians to each of the 36 children during the month preceding the completion of the ABILITIES model.

Based on the various sources of data, the following conclusions were reached. First, the scores from the ABILITIES model were very reliable when tested in a test-retest fashion. Second, interrater reliability was also quite high given that there was some variance between teachers in their familiarity with the students. Third, the model was efficient to use because the teachers only required approximately 3 to 5 minutes to complete the model for each child. Fourth, the model was too heavily weighted with motor functions. Fifth, several of the subscales (the two tonicity subscales and the extremities subscales) did not discriminate as well as had been hoped. Finally, while a number of the ABILITIES subscales correlated with BDI subscales as was expected, there were several correlations that were counter intuitive.

Consequently, it was determined that the ABILITIES model did not comprehensively contribute more information than the BDI. However, it was concluded that the incorporation of the Hearing and Sight Scales from the ABILITIES model with the BDI would provide a more comprehensive description for visually or hearing impaired children. The results of the preliminary field test indicated that the strengths and weaknesses of the BDI should be clearly documented during the subsequent field tests.

Part C: Description of Effects

The contractual specifications stipulated by the U.S. Department of Education required that the data collection system provide information about the effects of a particular early intervention program, without comparing the progress of children to another group of children who did not receive the intervention program. Numerous ways of measuring early intervention program effects in the absence of control groups have been proposed. Most are highly suspect for the purposes of this contract because they are theoretically incorrect, or they are easily compromised by personally invested users. A norm-referenced evaluation model, however, appears to be best suited for purposes of this contract.

In such a system, children would be measured at the beginning and end of a program with instruments that have age-appropriate norms available for the children being served. For example, if a 30-month-old child scores at the 25th percentile on the 30-month age norms of a test at the beginning of a program, and 6 months later at the conclusion of the program scores the same child (who is now 36 months old) scores at the 40th percentile on the norms for 36-month-old children, the conclusion can be drawn that the child has gained 15 percentile points more than would have been expected in the absence of a program. Although this approach sounds reasonable on the surface, it depends on the validity of the following assumptions:

1. The test used to evaluate the children was normed using handicapped children and has age-appropriate norms in small enough increments that it can be used at the beginning and end of the program.
2. The population of children on which the norming was done had not participated in early intervention programs.
3. The same test is used in pre- and posttest measurement, and these tests differ from those used to select children for the intervention.

In those cases where the above assumptions are reasonably tenable, this method offers a plausible alternative for assessing program effectiveness.

Since its introduction in the mid-1970s, the Title I Evaluation and Reporting System has been used to evaluate tens of thousands of Title I programs. Ninety-five percent of all reportees have used a norm-referenced evaluation model; many authors have concluded that it provides evidence of impact comparable to that which would have been obtained had true experimental designs been used. Based on the experience of the Title I program (now Chapter I), the norm-referenced evaluation model has been determined to be the best system to meet the evaluative needs of the EIPI. (This model will be examined more closely in the main and operational field test phases.)

Further, it was decided that the Battelle Developmental Inventory (BDI) best meets the criteria of available measures and should be used as the primary measure in making evaluative judgments of early intervention programs. It was determined that the results of the BDI should be reported for each child in the program to assess the effects of early intervention programs (as well as for descriptive purposes).

Part D: Description of Costs

The section of the EIPI designed to describe the costs of the program was based on work done previously by the Institute in conducting cost-effectiveness and cost-benefit studies of early intervention programs. Following Levin's (1983) "ingredients approach," the protocol for cost analysis is designed to assist programs in making a comprehensive inventory of the inputs of their service delivery. The protocol consists of two sections. The first section is a description and valuation of personnel resources, including volunteer time used by the program per annum. Since personnel costs typically account for a significant portion of a program's total cost (60-80%), these data are collected in great detail. The second section contains a description and valuation of nonpersonnel resources, including contributed space, equipment, and materials used by the program per annum. Together, these two categories provide a complete picture of total resources consumed by an early intervention program. This total cost is then divided by the number of children or another relevant unit of analysis to show the cost per unit.

Cost data from early intervention programs are important for several reasons. Most importantly, they provide critical information for decision making. Reliable information on program cost is necessary at the federal, state, and local levels for efficient allocation of scarce resources. The cost data provide an objective measure of the efficiency of program operation. A thorough cost analysis can indicate which programs are operating most efficiently and might be useful models for others, and it can identify programs that may be having difficulty operating efficiently. The information from cost analyses can be used to establish "bench mark" cost figures for various kinds of early intervention services and to investigate the potential exceptions that can cause costs to vary substantially from those of the "average" program in a region.

The development of the Cost Analyses section of the EIPI required two main stages. First, during the first year of the longitudinal studies project (1985/86), the cost forms were developed by conducting intermittent informal pilot tests with personnel at sites participating in the feasibility studies. Second, after several revisions were made, the forms were formally pilot tested with three of the feasibility study sites in Illinois. This pilot study led to several significant revisions that resulted in the basic cost analysis protocols used by the Institute in all of its studies. This basic protocol was then adapted for use with the EIPI in preparation for the main field testing.

MAIN FIELD TESTING

A main field test was conducted to formatively evaluate the EIPI as well as to document, summatively, the usefulness of the protocol. Methods used in conducting the Main Field Test were variable between the four parts of the EIPI. The following section will report on the main field testing of each portion of the EIPI.

Parts A & B: Description of Programs and Descriptions of Children

Methods

To evaluate the usefulness of the first draft of Parts A and B of the EIPI, 10 providers of preschool programs for handicapped children and their families were identified who agreed to participate in a field test. These 10 providers were given copies of the EIPI, a brief oral explanation of the purposes of the protocol, as well as an explanation of the purpose of the field testing. Because the main purpose of the field test was to collect further formative data on the efficiency and ease of using the protocol, as well as the adequacy of each item, the EIRI staff member requested that the providers indicate any problem areas or suggestions on their protocols. Further, the providers were requested to contact the staff member by telephone if any major difficulties arose while completing the protocol.

The 10 service providers involved in the field testing were from both metropolitan and rural areas throughout the state of Utah. Eight of the programs were center-based, one was home-based, and one provided a combination of home- and center-based services. After a 2-week period, all 10 completed protocols had been received in the mail by EIRI. The protocols were first reviewed for comments and suggestions. A list of comments and suggestions was compiled and used in making subsequent revisions of the EIPI. Second, the protocols were coded and the data were entered into the computer. Descriptive statistics were then obtained that would be useful in describing the results of the main field test.

Results

The results of the main field test will be discussed with respect to the two basic questions that were addressed: first, is the protocol efficient and simple to use, and second, does the protocol yield information that is meaningful and useful?

Efficiency and ease of use. Data on the efficiency and ease of use were collected during the formative stages of the protocol, as well as by asking each of the participants in the main field testing to indicate the length of time the protocol required to complete and to comment on the ease of completing it. The results indicated that the protocols required between 40 to 65 minutes to complete per program. The participants indicated that while each item was "very clear," the overall task was demanding. Approximately one-third of the participants suggested that if completion of the protocol was required as a part of a contract, supplemental initiatives should be included.

Usefulness of yielded information. The purpose of this section is to demonstrate how the resulting data of the EIPI might be analyzed and displayed. It should be noted that the actual descriptive results themselves are of less relevance to this field test than is the discussion of potential presentations and their usefulness when describing and classifying early intervention programs. Furthermore, the small number of completed protocols limits to some degree the number of analyses that can be meaningfully presented. Consequently, in addition to the results of the 10 programs involved in the field testing, several hypothetical examples will also be used in discussing the potential use of results of the EIPI protocol.

Figure IV.1 provides a summary display of the 10 programs according to setting, enrollment, integration, instructional groupings, intensity and duration, and attendance. Such a display is useful in depicting the types of programs included in the sample. This display, for example, shows that most of the programs are center-based, with 70% serving fewer than 50 handicapped students each. Several of the programs integrate handicapped and nonhandicapped students, although most do not. Instructional groupings tend to be small groups, although some time is spent in large group and one-on-one instruction. However, there is some variation with respect to intensity and duration: 4- to 5-day-per-week intensity is slightly less prevalent than less-intense service. On the other hand, there appears to be an essentially equivalent percentage of programs that provide service for 2- to 3-hour durations compared to those that provide less than 2 hours of service per visit. With respect to attendance, most programs reported that on the average they provided service for more than 1 year to each child, some up to a third year. Further, most programs reported attendance rates above 75%.

While this display emphasizes predominant types of program ingredients, it also can be used as an illustration of the less dominant types of program ingredients. For example, few of the programs represented in this sample were home-based or combination home- and center-based, and few of the programs served more than 100 children. None of the programs provided services for more than 3 hours per visit.

The type of analysis shown in Figure IV.1 provides a meaningful map of the program data. However, information is lacking that would be useful in segregating meaningful groups of programs according to combinations of program ingredients.

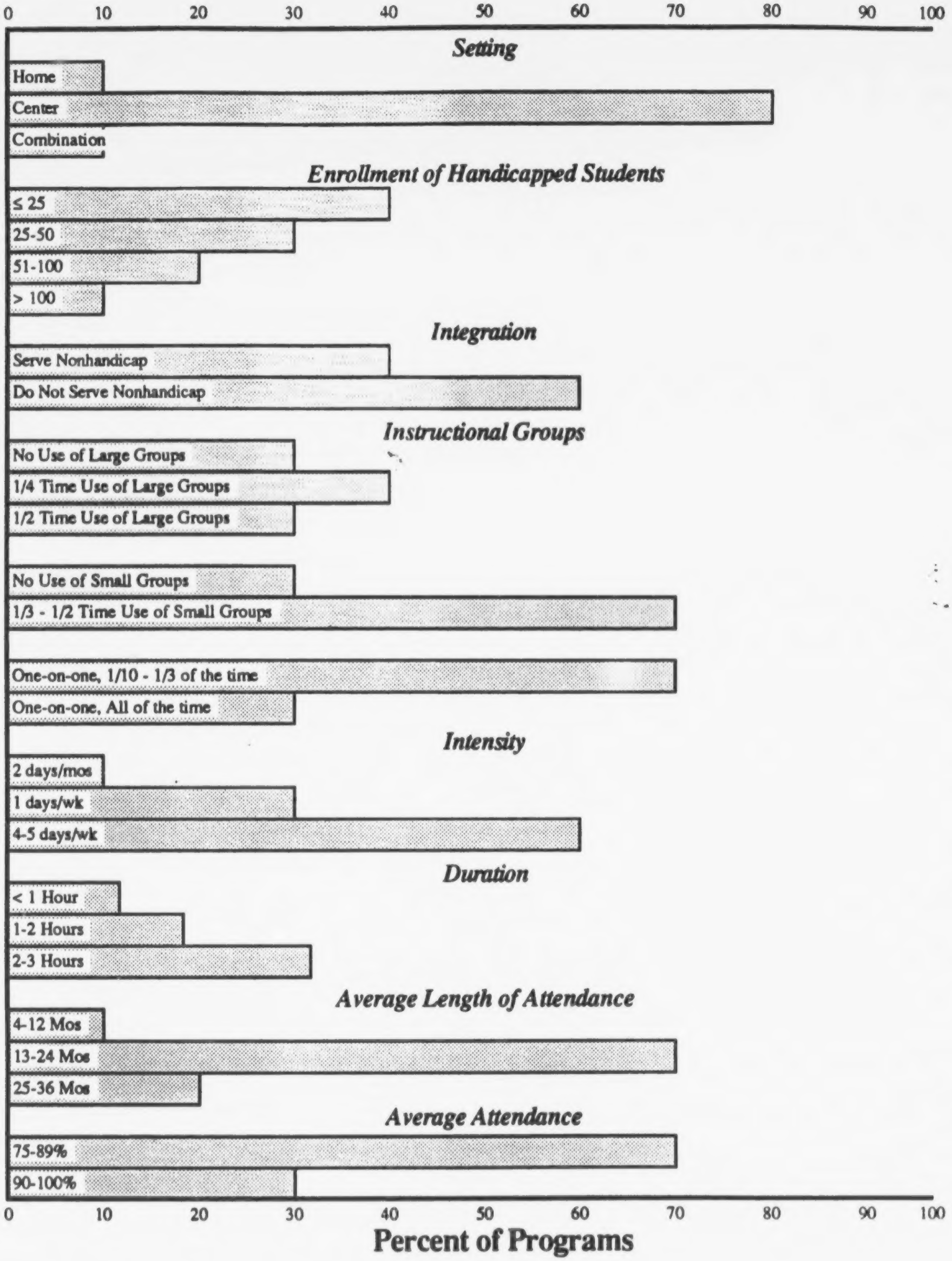
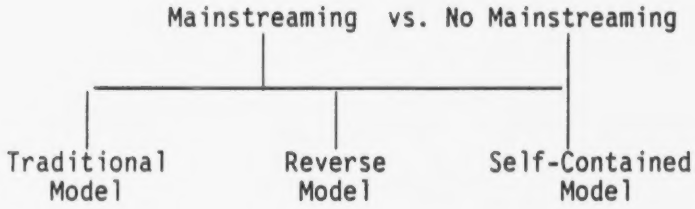


Figure IV.1: Summed description of program characteristics.

Analysis of frequency tables enables one to note emerging patterns across several different variables or ingredients that may be grouped for further analysis. For example, as can be seen in Table IV.1, four programs are serving both handicapped and nonhandicapped students. Two of the programs (2 and 7) are using a traditional mainstreaming model in which handicapped students are mainstreamed into a nonhandicapped students' environment; while two other programs (1 and 5) are using a reverse mainstreaming model where nonhandicapped students are mainstreamed into the handicapped students' environment. In further comparing these two pairs of mainstreamed, center-based programs, it becomes apparent that the pair using the traditional model have identical percentages of time spent in large group, small group, and one-on-one instruction. In contrast, those using the reverse mainstreaming model reported higher percentages of time spent in one-on-one and small group instruction.

From this simple analysis, it is apparent that it is possible to classify center-based programs according to the following characteristics:



Additionally, it is plausible to group programs with respect to the ratio of handicapped students to nonhandicapped students. This would further distinguish mainstreamed programs under each of the two mainstreaming models. Depending on the sample of programs being described and compared, grouping by ratio may be more meaningful than grouping by mainstreaming model; actually creating more discrete groups.

In looking further at the center-based programs, it is evident that the percentage of time spent in large groups, small groups, and one-on-one instruction is

Table IV.1

Individual Program Characteristics

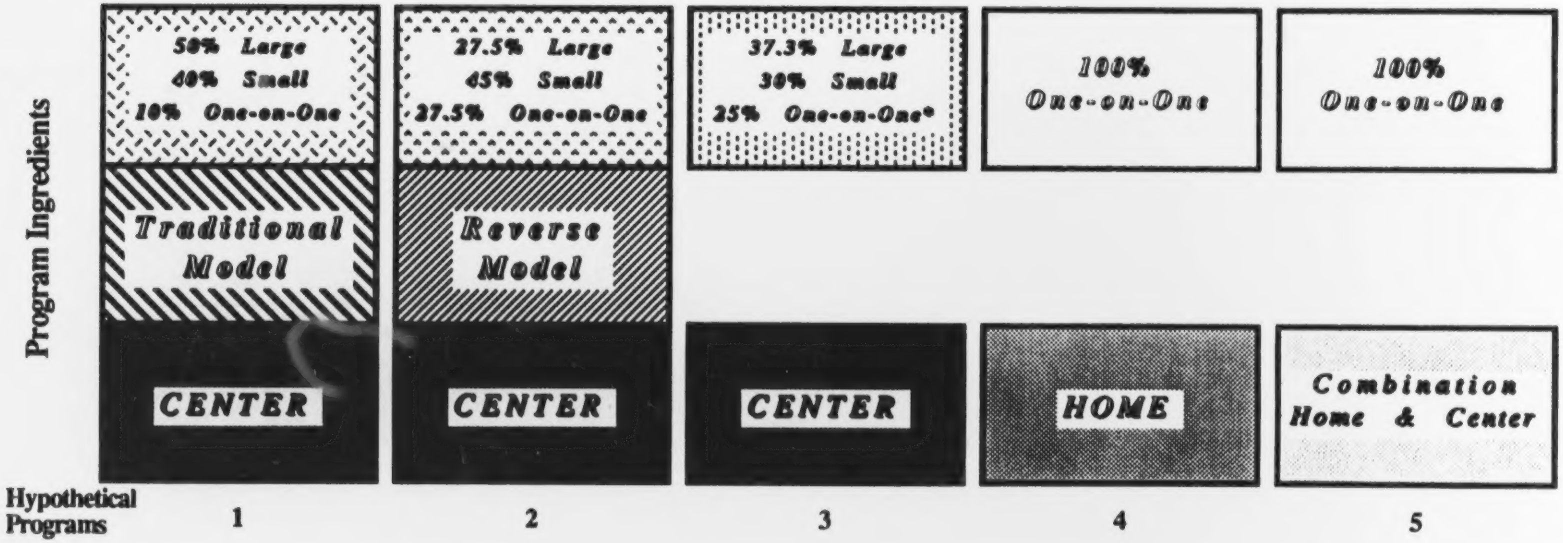
Program	Setting	# Handi.	# Non-Handi.	Average Ratio	% Large Group	% Small Group	% 1 on 1	Intensity	Duration	Length of Enrollment	Attendance
1	Center	65	6	2.3:1*	25%	50%	25%	5 days/week	2-3 hours	13-24 months	75 - 89%
2	Center	22	197	1:10	50%	40%	10%	5 days/week	< 1 hour	13-24 months	90 - 100%
3	Center	40	0	1:0	25%	50%	25%	5 days/week	2-3 hours	13-24 months	75 - 89%
4	Combination Home & Center	10	0	1:0	0%	0%	100%	1 days/week	1-2 hours	13-24 months	75 - 89%
5	Center	16	3	2.5:1	30%	40%	30%	5 days/week	2-3 hours	13-24 months	90 - 100%
6	Home	83	0	1:0	0%	0%	100%	2 days/mos	1-2 hours	13-24 months	75 - 89%
7	Center	47	280	2.9:16	50%	40%	10%	1 day/week	< 1 hour	4-12 months	
8	Center	18	0	1:0	30%	40%	30%	5 days/week	2-3 hours	25-36 months	75 - 89%
9	Center	38	0	1:0	50%	30%	20%	5 days/week	2-3 hours	13-24 months	75 - 89%
10	Center	23	0	1:0	0%	0%	100%	1 day/week	1-2 hours	25-36 months	90 - 100%

* of a total of 8 classrooms, 2 mainstreamed, resulting this averaged ratio

essentially equivalent across programs. Additionally, in examining these programs across the other variables in each row in Table IV.1, there appears to be only negligible differences between the programs, although there is a variation in intensity and duration.

Once an initial scanning analysis is completed, and a preliminary sense of emerging groupings obtained, a cross-tabulation producing more precise data about the groupings can be conducted. Using the first example pertaining to mainstreamed programs, a cross-tabulation could be performed to develop discrete groupings of programs according to key ingredients. Obviously, grouping 10 programs has little value. If, however, this analysis were done for 100 programs, such groupings would be more meaningful in understanding service patterns of early intervention programs. Further, it is likely that as the number of programs for which data are collected increases, this variance will increase also, possibly revealing other subgroups under mainstreaming pertaining to different degrees of program intensity or degrees of program duration.

Figure IV.2 illustrates one way the data of the first portion of the EIPI protocol can be used to produce discrete types of early intervention programs. As will become more evident as the results from the remainder of the EIPI are discussed, this manner of grouping programs by combinations of key ingredients could ultimately produce unwieldy numbers of groups that would be difficult to use in making meaningful comparisons. However, one of the objectives of this field test is to demonstrate how carefully selected combinations of program characteristics or ingredients that emerge may result in a meaningful and limited number of types of programs, which may then be used in making cost-effectiveness comparisons. In the remainder of this section, the results of the curriculum, staffing, services, family involvement, philosophical orientation, and descriptions of children will be presented. First, summed descriptions of these characteristics will be presented to demonstrate how general trends pertaining to those areas of service can be described.


Program Ingredients
50% Large
40% Small
10% One-on-One
Traditional Model
CENTER
27.5% Large
45% Small
27.5% One-on-One
Reverse Model
CENTER
37.3% Large
30% Small
25% One-on-One*
CENTER
100% One-on-One
HOME
100% One-on-One
Combination Home & Center
Hypothetical Programs
1
2
3
4
5

*one of the non-mainstreamed programs served infants in only an one-on-one fashion, which constitute another program type.

Figure IV.2: Program ingredients constituting discrete programs.

The results of the scanning analysis and subsequent cross-tab analyses will be presented to more completely demonstrate how those characteristics can be combined to form meaningful, discrete groups or types of early intervention programs.

Another key ingredient in creating discrete categories of early intervention programs is the use of commercially available curriculum materials. Eighty percent of these programs use a commercially available curriculum 10 to 25% of the time, while 20% use a commercially available curriculum 50 to 75% of the time. When dealing with a larger set of programs, grouping programs according to commercial curriculum-use may lead to patterns of meaningful comparisons. Individually, such groupings may not be very meaningful. However, when incorporated with other highly correlated ingredients, such as those to be discussed in the remainder of this section, discrete categories of early intervention programs may emerge.

Staff and service characteristics are also useful in describing and classifying programs. For example, Figure IV.3 illustrates the groupings of programs according to staff/child ratios. Fifty percent of the programs have low staff/child ratios, while 30% of the programs have a medium staff/child ratio and 20% a high staff/child

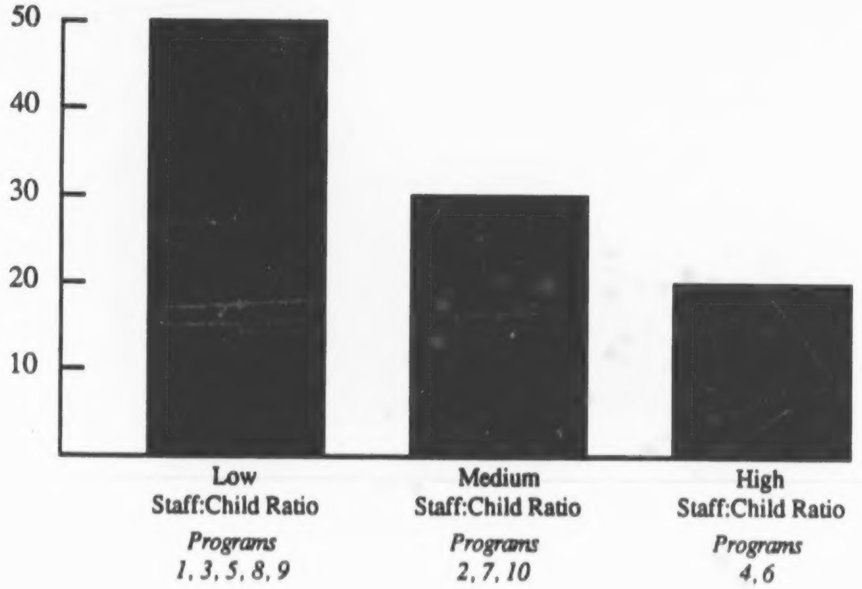


Figure IV.3: Groupings of programs according to staff:child ratio.

ratio. A perusal of Table IV.2 shows that there are potential staffing patterns that might also lead to meaningful groupings of programs. Groupings could potentially be made according to the number of different types of staff in a program, the total number of staff, different combinations of types of staff, and the amounts of those types of staff. For example, in the 10 programs, teachers' aides are the most predominantly used staff, while certified and noncertified teachers, speech therapists, and volunteers are the other most commonly represented staff in the programs. Several programs rely heavily on volunteers and university students, which may be one set of variables constituting a grouping of programs. For example, one program relies on volunteers and university students to comprise more than half of the staff, while teachers' aides make up the largest portion of the remainder of the staff. Such a staffing pattern may, when describing a larger sample of programs, emerge as important in distinguishing programs that rely heavily on professionally trained staff from programs that rely most heavily on nonprofessional personnel. Additionally, it may be useful to note that there is a significant lack of programs that staff licensed psychologists, behavior therapists, psychiatrists, nutritionists, or physicians. Data presented in Table IV.2 also indicate that the staff/child ratio of the 10 programs ranged from 1.2:1 to 1:20.8, which reveals another potentially meaningful categorization of programs. Cost-effectiveness comparisons between groups of programs of different staff/child ratios could produce results that could be helpful in determining subsequent allocation of funds.

Programs may also be described and grouped according to types and amounts of services that are provided. Figure IV.4 shows that the programs could be classified by the degree of comprehensiveness of services. This example represents a normal distribution of comprehensiveness, with 60% of the programs providing a medium degree of comprehensiveness. More detailed patterns can emerge by closely examining Figure IV.5. This figure shows that high comprehensiveness, as represented by Programs 1 and 8, can be characterized more specifically as programs that not only provide

Table IV.2

Description of Programs with Respect to Staffing Patterns

STAFF	PROGRAMS									
	1	2	3	4	5	6	7	8	9	10
Teachers										
Noncertified	0	86%	21%	0	0	0	0	0	0	0
Certified	5%	6%	0	0	29%	31%	15%	24%	19%	0
Teacher's Aides	20%	6%	35%	.25%	29%	0	15%	30%	47%	22%
Speech Therapists	5%	.4%	7%	25%	4%	31%	2%	12%	9%	22%
Physical Therapists	4%	0	7%	25%	4%	0	0	8%	5%	22%
Occupational Therapists	0	.4%	1%	25%	0	0	0	4%	2%	22%
Adaptive P.E. Teachers	0	0	0	0	0	0	0	0	0	0
Licensed Pyschologists	0	.4%	0	0	0	0	1%	.4%	0	0
Behavior Therapists	0	0	0	0	0	0	0	0	0	0
Psychratrists	0	0	0	0	0	0	0	0	0	0
Nutricians/Dieticians	0	0	0	0	0	0	0	0	0	0
Physicians	0	0	0	0	0	0	0	0	0	0
Nurses (RN or LPN)	3%	0	0	0	0	20%	2%	2%	0	0
Volunteers	26%	0	21%	0	29%	0	45%	4%	0	0
University Students	26%	0	0	0	0	0	0	4%	0	0
Administrative Staff	3%	1%	2%	0	3%	0	1%	6%	0	0
Clerical	3%	.4%	2%	0	3%	18%	4%	4%	0	0
Other	5%	0	3%	0	0	0	16%	0	19%	12%
Total Students	71	219	40	10	19	83	327	18	38	23
Ratio of Direct Service Staff:Students	1:2.1	1:8.7	1:3	1:125	1:2.9	1:20.8	1:7.5	1.2:1	1:4.4	1:6.4
Total # of Direct Service Staff	34.5	25.3	13.2	0.8	6.6	4.0	43.5	22.1	8.7	3.6
Total # of Staff	38.5	25.7	14.3	0.8	7.0	4.9	55.0	24.6	10.7	4.1

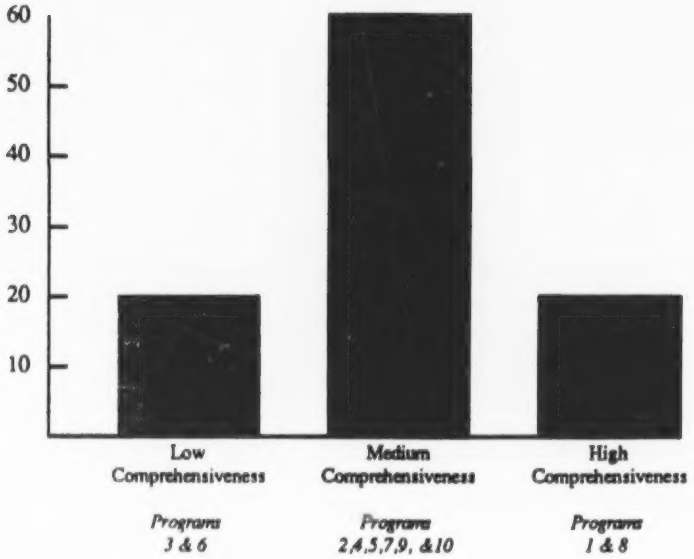


Figure IV.4: Groupings of programs according to comprehensiveness of services.

Program	Educational/Developmental Skill Development	Speech Therapy	Physical and/or Occupational Therapy	Adaptive Physical Therapy	Routine Medical/ Health Care	Major Medical Care	Music Therapy	Nutritional Supplements or Counseling	Swimming	Psychological Services for the Child	Psychological Services for Family Members
1	■	■	■	□	□	→	□	□		□	□
2	■	■	■	□				→		→	→
3	■	■	■								
4	■	■	■					→		→	■
5	■	■	□	□	→			→	□	□	→
6	■	□						□			
7	■	□	→		■			□		■	□
8	■	■	■	□	→		□	□	□	■	→
9	■	■	■					→		→	□
10	■	■	■					→		□	□

■ Available to all in program
□ Available on a limited basis
→ Available through program referral

Figure IV.5: Services available from each program.

educational and/or developmental skill development, speech therapy, and physical and/ or occupational therapy to all who need it, but on a limited basis provide an additional six to seven other services, including a referral service. To the other extreme, low comprehensiveness, as shown in Programs 3 and 6, can be characterized as providing educational and/or developmental skill development service to all who need it and only one or two limited services. The majority of the programs provided a medium comprehensiveness of services, usually including, to some degree, educational and/or developmental skill development, speech therapy, physical and/or occupational therapy, and limited services and referrals for three to five other types of services.

Family involvement is an important emphasis of many early intervention programs, although the types of family involvement activities can vary from program to program. Hence, programs can be described with respect to different types of family involvement activities that are used. Table IV.3 shows the percentages of programs using each type of family involvement and the degree to which it is used. This display indicates that educational planning and parents as therapists are the most commonly used family involvement activities, while family classroom aides and group meetings are used to a fairly moderate degree. Resource access, respite care, and parent-to-parent networks, however, are infrequently used. Thus, one way in which programs may be classified with respect to family involvement issues is according to whether they provide resource access, respite care, and parent-to-parent networking activities.

While no obvious patterns or combinations of family involvement activities emerged beyond those discussed above, a closer look at the results could reveal meaningful categories of programs. For example, programs that provide parent training, classroom aide activity, group meetings, program governance, and educational planning to more than half of their parents may be distinguished from programs that provide mainly respite care service and a parent-to-parent network.

Table IV.3

Extent of Program Usage of Parent Involvement Activities

	Not Available In Program	Only By Referral To Other Programs	Used By 1-25% Of Parents	Used By 26-50% Of Parents	Used By 51-75% Of Parents	Used By More Than 75% Of Parents
a. **Parents as Therapists.** Training family members to teach the child developmental skills such as feeding, language, or motor skills. Teaching may be integrated in daily activities or at separate times in the home.			10%	20%	30%	40%
b. **Classroom Aide.** Regular participation by family member(s) (at least once a month) as aides in the classroom to assist with programming.	30%		10%		40%	20%
c. **Group Meetings.** Parent, sibling, of father group meetings at least twice a year designed to provide mutual support, information, parenting skills, or a network of people in similar situations.				60%	10%	30%
d. **Resource Access.** A structured program to assist family to obtain housing, medical care, food, counseling, or other community based services that are not provided directly by the early intervention program.	10%	50%	10%	20%		10%
e. **Respite Care.** Weekend, evening, or vacation child care provided in addition to the regular program.	30%	60%	10%			
f. **Parent-to-Parent Network.** An organized program which uses "experienced" parents to contact and provide individual support and assistance to "new" parents.		40%	50%	10%		
g. **Program Governance.** Opportunities for parents to take an active role in deciding the content, organization, and staffing of the program.	30%		40%	20%		10%
h. **Educational Planning.** Parents are involved in developing their child's educational program.						100%

As with the other areas of programming, family involvement activities can vary and may be used in classifying programs for descriptive or cost-effectiveness comparisons.

Additionally, programs may be differentiated according to philosophical orientations. Of all of the characteristics of early intervention programs, philosophical orientation is the most difficult to assess, because there often are numerous philosophic orientations within a given program. One useful way of describing philosophical orientation in early intervention is to indicate the degree to which a program is either behavioristic or developmental. Figure IV.6 illustrates where each of the programs fall on a continuum between behavioristic and developmental orientations. Classifications of programs with respect to where they fall on this continuum can result in categories that are meaningful for descriptive comparisons. The assessment of philosophical orientation enables programs to be grouped according to their cumulative ratings (i.e., low ratings correspond with strong behavioristic orientation, moderate ratings correspond with a cognitive/environmental orientation, while high ratings correspond with a developmental orientation).

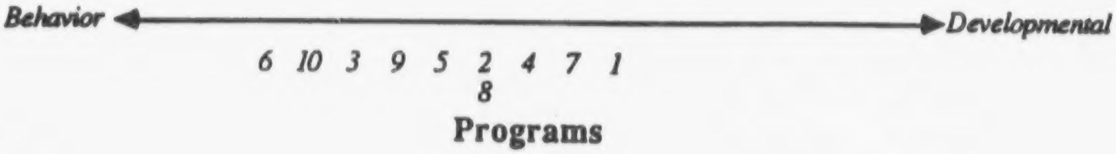


Figure IV.6: Description of Programs According to Philosophical Orientations

Thus, the Program Description Component of the EIPI yields a wide variety of information that can be used to descriptively characterize trends in early intervention programming and to classify programs according to meaningful program ingredients.

The results of the main field test for the Description of Children component can be used in a similar fashion. As can be seen in Table IV.4, the majority of children served by these programs were White, from two-parent homes, whose parents were blue-collar workers. For comparative purposes, programs may be classified with respect to child characteristics such as: (a) programs comprised of homogeneous ethnic origins versus programs comprised of heterogeneous ethnic origins; (b) programs predominantly serving two-parent homes versus programs serving single-parent homes (which may be especially meaningful when classifying programs in combination with parent involvement ingredients); and (c) programs predominantly serving children from white-collar homes versus programs predominantly serving children from blue-collar, unskilled, or unemployed homes.

Table IV.4

Description of Children According to Race or Ethnic Origins, Parent Employment Status, and Guardianship

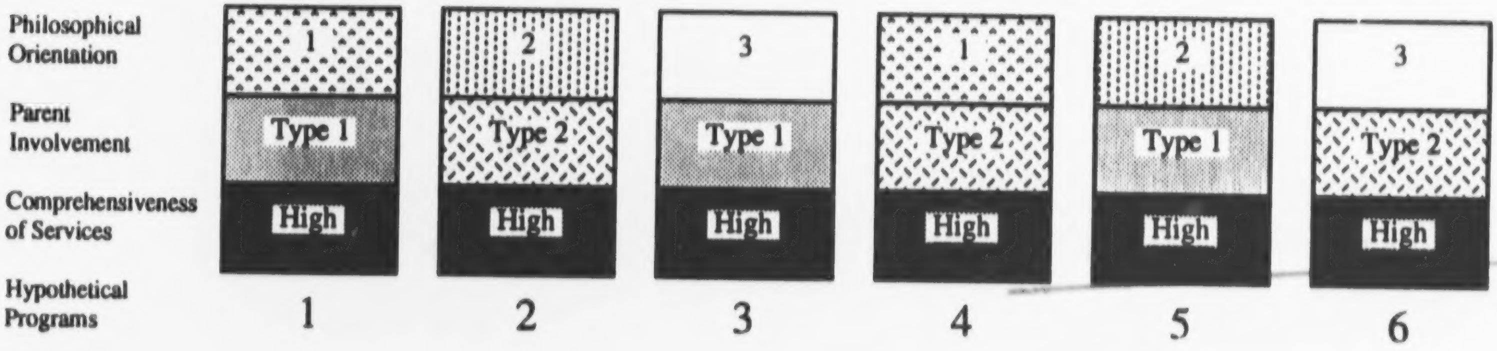
	1	2	3	4	5	6	7	8	9	10	TOTAL
White	52%	90%	87%	90%	75%	98%	84%	88%	90%	92%	84.6
Black	2%	0	3%	0	0	5%	1%	0	0	0	.65
Hispanic	3%	10%	5%	10%	25%	5%	8%	0	10%	4%	8.55
Asian	2%	0	5%	0	0	5%	7%	10%	0	0	1.55
Native American	41%	0	0	0	0	5%	0	2%	0	4%	4.65
Both Parents at Home	62%	54%	75%	80%	40%	73%	50%	90%	79%	87%	69
One Parent at Home	15%	32%	18%	20%	50%	25%	45%	8%	18%	13%	23.6
Living with Relatives	12%	0	7%	0	10%	1%	3%	2%	3%	0	3.8
Other	11%	14%	0	0	0	1%	2%	0	0	0	2.8
White Collar	9%	32%	20%	20%	20%	10%	1%	60%	46%	61%	27.9
Blue Collar	37%	18%	63%	70%	50%	75%	3%	25%	35%	26%	40.2
Unskilled	32%	27%	5%	10%	20%	10%	45%	10%	0	0	15.9
Unemployed	22%	23%	12%	0	10%	5%	51%	5%	19%	13%	16

Programs can also be categorized according to the type and degree of handicapping conditions of children they serve. In the main field test, a total of 468 children were classified by type and degree of handicapping condition. Data from this group reveal that the largest percentage of children (34.1%) were classified as having general developmental delays. This group was followed by children who were speech and language impaired (26.9%) and children who were multiply handicapped (16.7%). The remainder of the children were classified as learning disabled, orthopedically impaired, behaviorally disordered, autistic, hearing impaired, emotionally disordered, or visually impaired (22.3%). Further, the children were found to be primarily mildly to moderately handicapped. Once again, the programs could be categorized and evaluatively compared based on the populations they serve such as: (a) comparisons between several programs serving exclusive populations: hearing impaired versus visually impaired versus autistic; and
(b) comparisons between programs serving children with a specific handicapping condition such as autism, with more general programs serving children with a wide range of handicapping conditions. Programs categorized by degree of severity of handicapping conditions could also be compared for effectiveness. For example, there are potential comparisons between programs serving only profound populations and programs integrating all degrees of severity. Figure IV.7 illustrates each of the above potential groupings of programs according to child characteristics by which programs may be compared with respect to cost-effectiveness.

Part C: Description of Effects

Methods

Over a 2-year period, the Battelle Developmental Inventory (BDI) has been used at each of the sites participating in the longitudinal studies. Pre- and posttests have been conducted by qualified diagnosticians who have been trained to administer the BDI. These years of experience with the BDI, along with performing the function of providing a core measure for each of the longitudinal studies, have also provided


Philosophical Orientation
Parent Involvement
Comprehensiveness of Services
Hypothetical Programs
1
Type 1
High
1
2
Type 2
High
2
3
Type 1
High
3
1
Type 2
High
4
2
Type 1
High
5
3
Type 2
High
6

LEGEND:

Philosophical Orientation
1. Behavioristic
2. Cognitive/Environmental
3. Developmental

Parent Involvement
Type 1: Involvement in parent training, group meetings, classroom aide, program governance and educational planning
Type 2: Resource access, respite care, parent to parent network, educational planning.

Figure IV.7: Groupings of programs.

an opportunity to extensively examine the use of the Battelle in a norm-referenced evaluation model, its strengths and weaknesses, and ways in which it can be adapted with respect to administration and reporting of the results.

This long-term field test of the BDI has involved numerous activities in a formative process aimed at improving the validity of test administration, scoring, and reporting of the results. The results of the pilot phase are in the form of strengths and weaknesses noted on the use of the Battelle. It should also be mentioned that a detailed set of recommendations has been submitted to DLM, publishers of the Battelle, with the objective of providing them with suggestions for improving the standard administration and scoring of the instrument.

Strengths of the BDI. The BDI has many features that make it an attractive instrument for its use in measuring developmental functioning in children. The BDI measures development functioning in five areas: personal-social, adaptive, motor, communication, and cognition. Administration procedures use interview, observation, and structured administration formats. Thus, the BDI can be considered to be a multidisciplinary, multi-method assessment instrument in keeping with the spirit of P.L. 94-142 and P.L. 99-457.

The BDI was standardized on a national sample of 800 children, providing standard scores for estimating performance. Many states require norm-referenced measures for determining eligibility for early intervention services; thus, the BDI would fulfill this requirement. During the norming process, the BDI was also administered to a sample of children with various handicapping conditions, resulting in standardized adaptation procedures for testing children with physical, visual, auditory, speech, or emotional impairments. The BDI is one of the first norm-referenced tools to address the needs of children who require alternative modes of communication when being tested.

Another notable feature of the BDI is the method for scoring progress on individual items. Rather than receiving simply a "pass" or "fail," credit can also be given for emerging skills, making the BDI more sensitive. Finally, the BDI is appropriate for measuring development in children ages birth to 95 months. This broad age range makes the measure conducive for following children's progress longitudinally, and it can facilitate transition by serving as a constant measure throughout a child's early intervention and early school years.

Weaknesses of the BDI. The BDI, like all tests, is not without its weaknesses. Due to the small norming sample, the normative tables only report standard scores to 65 DQ, or a z-score of -2.33. This makes it difficult to use standard scores to measure progress in children with moderate to severe handicaps. There are also minor problems with the administration procedures for administering the BDI. The BDI requires a large number of materials and can be quite cumbersome. The test also calls for a great deal of study and practice before it can be proficiently administered. Because the test is so comprehensive, it is also time consuming to administer. Further details about the potential difficulties with using the BDI as a norm-referenced measure have already been discussed in an earlier section of this report. As a criterion-referenced test, the BDI seems to be quite useful if testers have demonstrated prior competencies in administering the test and make use of general testing strategies for encouraging and maintaining child performance.

Summary. It was determined that the overall strengths of the BDI outweigh its weaknesses, making it an instrument worthy of use in the field of early intervention. To use the BDI, a data recording form was developed that would be included as the main "Description of Effects" portion of the EIPI. During the main field test of Parts A and B in which 10 early intervention programs completed the forms, four of the sites that had administered the Battelle at least once to the children in their program were asked to complete the Description of Effects form. They reported their data on the recording form and reported having no difficulties with the form itself. It was determined, however, that it would be more appropriate, based on the other findings of the main field test of the Battelle, to require the programs to report a

Normal Curve Equivalent (NCE) as a standard score on each domain, including NCE gains for each child as well as a program-average NCE gain on each domain and on the total BDI score. The form was revised according to this decision and was then in the form in which it would be operationally field tested.

Part D: Description of Costs

Cost analyses were conducted locally using the cost protocol adapted from the one used for the longitudinal studies. Two early intervention programs in the Utah Preschool Providers group agreed to complete the cost forms for a nominal fee. The protocol was quite long and complex and could not be completed by individual programs. After several phone interactions where assistance was provided to the sites, the forms were returned to EIRI for final calculations to produce an overall cost per child. The main field test obviated the need for a system of collecting cost data that could be independently used by sites. It was deemed necessary, on the basis of the amount of individual assistance required by each program, to produce either a completely new, very brief form that would be simple to use or revise the long form such that a final result could be computed by each program without any assistance from EIRI. The short form would sacrifice detail for the sake of simplicity. The long form would retain the detail and complexity of the original protocol, but with enough written instruction to be completed without assistance. For the operational phase of the field test, two instruments were designed for the pilot test: (1) a "long" form based directly on the EIRI cost collection instrument and (2) a "short" form based on a modification of the system used by Rand Corporation to collect costs for public school special education programs (Kakalik et al., 1981).

Summary of Main Field Testing

The types of classifications of programs that have been presented here (based on information collected from Parts A and B) could be quite useful to any number of individuals or agencies responsible for overseeing a large number of early intervention programs. For example, a state coordinator of early intervention programs may use the information produced by the EIPI for several purposes. First, the information could be used to determine and/or monitor current trends with respect to key ingredients and costs of early intervention programming. In so doing, it would be possible, for example, to know precisely how many center-based, home-based, combination home- and center-based, and residential programs were operating, how many handicapped and nonhandicapped children were served by each, what degree of intensity and duration of services were provided by each, the costs of each, as well as to know other specific information about each program with respect to curriculum use, staffing patterns, availability of other services, parent involvement, and philosophical orientation. Not only could such an administrator have an overall map of his/her programs with respect to programming trends, it would also be possible to determine gaps in current programming. For example, it would be possible to determine, if it were the case, that relatively no programs were providing residential services, that few programs were using a reverse mainstreaming program, or that, cumulatively, programs tended to not provide comprehensive services to children and families. Such information may be very useful in determining subsequent allocations of funds, as well as be useful to referral agencies that need precise information about what programs provide which services.

The information yielded by the EIPI could also help such a state coordinator to classify programs according to key programming ingredients that could then result in groups of programs for which cost-effectiveness comparisons could be made. For example, a state coordinator may find it useful to know if home-based programs providing low comprehensiveness of service to a set of children with severe language impairments is more cost-effective than center-based programs that provide moderate comprehensiveness of services to the same type of population. Additionally, a state coordinator may find it useful to know whether high-intensity programs serving mildly and moderately handicapped children were more cost-effective than lower-intensity programs. Such information may be very useful in subsequent planning of new programs as well as in determining what ingredients new programs should or should not be included in future endeavors.

Thus, the results of the main field testing of the EIPI indicated that, although still in formative stages, it is an efficient, simple to use, and useful system for those individuals or agencies interested in knowing and monitoring current programming practices, identifying gaps in current practices, and/or conducting cost-effectiveness comparisons of different groups of existing programs to determine what program ingredients service providers should be encouraged to include as future programs are developed or as existing programs are adapted to better meet the needs of those they serve.

OPERATIONAL FIELD TEST

All four parts of the EIPI were field tested in a two-part operational field test, including seven early intervention programs. This section will report the methods of the two-part field test, the findings of each, and final recommendations for the use of the EIPI.

Methods: Part 1

Three early intervention programs operating in the state of Utah and serving 3- to 5-year-olds participated in the first part of the field test. Of the three programs, one functioned in a rural/remote area, while two functioned in rural/urban settings. Each of the three programs were visited by an EIRI staff member during which the program staff were extensively interviewed about their programs and the intervention services were observed. These visits were conducted in order to compare information obtained from the EIPI with what was obtained via interviews and observations. As a part of the interviews, information for most of the items in Parts A and B was collected, although not in the format asked in the EIPI itself. Following the interview, the program staff were asked to complete the EIPI and return it to EIRI. The EIRI staff member conducting the interview also completed a EIPI protocol for each program, based on the information collected during the interviews and observations. The protocol's completed by EIRI were then compared for agreement to the protocols completed by staff at each respective program.

After agreement was assessed, EIRI prepared a summary of each program based on the information that they provided in the EIPI. These summaries were given to each program. Following their review of the summaries, the program respondents were interviewed about the accuracy of the summaries, the use of the EIPI, and any suggestions they had for using the EIPI to collect such information from other programs. Additionally, program staff were asked to complete Part D: Description of Costs (the long form) and to submit it to EIRI.

None of the programs had completed Battelle testing of their children; therefore, the Description of Effects form was not tested with these four programs in the first part of the operational field test. However, the Child Performance Recording Form, which constitutes Part C: Description of Effects, was operationally field tested with four of the sites participating in the longitudinal studies. For each of the four programs, staff were asked to complete the Child Performance form on 10 children to ensure that no additional problems were encountered in using the form.

Results: Part 1

Part 1 of the operational field test produced several results. First, a description of the programs will be presented as well as a summary of available services across the sites. Second, the reliability check of the EIPI will be discussed. Third, a discussion of adaptations made to the EIPI based on the first portion of the operational field test will be reviewed.

Description of Programs

Before presenting the integrated summary of the four programs, each of the four programs will be briefly described based on information obtained in Parts A and B.

Weber Preschool. Weber Preschool is a center-based program that provides preschool services to handicapped children, birth through 5 years of age, who reside in Weber and Morgan counties in Utah. Currently, they are serving 66 children between the ages of 3 and 5 years in four, 4-1/2 hour sessions per week. Approximately 32 of these children are mildly handicapped, 19 are moderate, and 15 are severe. Additionally, 5 nonhandicapped children participate in an integrated, reverse mainstreamed classroom. Of the 66 children, 63 are Caucasian, 2 are Hispanic, and 1 is Native American. Currently, the Weber Preschool has six classes, each of which is tailored to meet the needs of children with a particular severity of handicapping condition. One of these consists of the most mildly handicapped and is an integrated, reverse mainstreaming program including five nonhandicapped children.

Jordan School District. Jordan Valley Preschool is a center-based program that provides preschool services to handicapped children, 3 to 5 years of age, who reside in the Jordan Valley School District in Utah. Currently, they are serving 85 handicapped children during a 5-day-per-week, 2-hours-per-day program. Of these children's handicapping conditions, 19 are mild, 40 are moderate, 18 are severe, and 8 are profound. Additionally, 21 nonhandicapped children are served in integrated classrooms that, on the average, have 4 handicapped children to every 1 nonhandicapped child. Of all of the children involved, both handicapped and nonhandicapped, 98 are Caucasian, 5 are Hispanic, and 3 are Asian.

Currently, 13 classrooms are in operation, 6 of which are integrated classes including the higher functioning handicapped children. The 13 classrooms are housed at four sites: Jordan Valley, Alta, Bingham, and West Jordan. Those children functioning with moderate to mild handicapping conditions are typically served in sites other than the Jordan Valley site, closest to where they live, and are participating in one of the integrated classrooms at that site. Those children with more severe handicapping conditions are served at the Jordan Valley site.

Con Amore Preschool. Con Amore Preschool is a center-based program that provides preschool services to handicapped children 3 to 5 years of age, who reside in Duchesne County in Utah. Currently, they are serving 18 handicapped children during a 5-day-per-week, 4-hours-per-day program. Of these children's handicapping conditions, eight are mild, eight are moderate, and two are severe. All 18 of the children are Caucasian. Sixteen have both parents living at home, and 2 come from single parent homes. A total of five of the parents would be classified as holding white-collar employment, eight blue-collar employment, two would be classified as unskilled, and three are unemployed. Currently, there are four classrooms in operation.

Comparisons and reactions. For the most part, the information obtained through the extensive interviews resulted in the same responses on the EIPI as were given by the program staff on the EIPI. A 96% agreement rate was found. Staff using the EIPI reported spending about 1 hour to complete it. While they said that each item was clear and understandable, they felt that the amount of time required was too great.

Methods: Part 2

The second portion of the operational field test included two early intervention programs participating as sites for the longitudinal studies (Project Pitch and Des Moines) and an early intervention program in Utah with which staff were familiar (Kids Who Count). Staff at each of the programs were asked to complete the EIPI with no assistance on the part of EIRI staff. Part C: Description of Effects was completed for children at Project PITCH and Des Moines. However, Kids Who Count did not conduct pre- and posttest BDI's on their children, and, therefore, Part C was not completed there. Based on the findings of the main field testing, two versions of the cost forms (a long and a short form) for Part D: Description of Costs were tested. The respondents at each of the three programs were instructed to complete the short form first, followed by the long form. A comparison of the data from the two forms would indicate whether the shorter, less time consuming form yields adequate information without any additional serious threats to validity and reliability. Following their completion of the EIPI, the program staff were interviewed to get their reactions to completing the EIPI and recommendations for future use.

Results: Part 2

Each of the three programs completed the description of programs and description of children sections. After program staff at the PITCH and Des Moines sites completed these sections, the EIRI site coordinators for those programs were asked to review the EIPI for accuracy. This activity demonstrated that the EIPI was actually collecting accurate data insofar as the descriptions could be evaluated by a third party who had at least 2 year of intensive experience conducting a study with the program. (For complete descriptions of these programs, see their respective site reports.) In addition to PITCH and Des Moines, a Utah-based program, Kids Who Count, participated in this field test. After completing the EIPI, EIRI staff conducted three interviews with the Kids Who Count program director and visited the program to determine the extent to which the data reported in the EIPI was accurate. No revisions were made. A description of that program is found in Appendix B. Thus, results of the operational field testing of Parts A and B supported the results of the main field testing.

Norm-Referenced Evaluation Model

One of the main foci of the main field test was to determine the best way to describe program effects in a norm-referenced model using pre and post (beginning and end of year) scores on the Battelle Developmental Inventory (BDI). The question addressed was, which of the scores available from the BDI will yield the most accurate and useful data for purposes of the pre-post evaluation design of an early intervention program? To address this question, BDI data from the PITCH and Des Moines sites were used (Kids Who Count did not have these data available).

As can be seen in Tables IV.5 and IV.6, the t-test results on each domain tend to differ somewhat depending on which scores were used in the analysis. For example, t-tests on raw scores and age equivalent scores consistently indicated statistically significant pre-post differences ($p < .001$). Thus, using these scores in a program evaluation, one may conclude that a remarkable gain had been made due to the children's participation in the program. There are, however, several limitations associated with the use of raw and age equivalent scores in this fashion that should be noted.

Raw scores are most appropriately used under two conditions: (1) when maturation effect is somehow accounted for by the design of the evaluation; and (2) when those using the scores are experienced enough with the particular test that the raw scores, themselves, are meaningful. For purposes of the EIPI, it cannot be assumed that either of these conditions will be met by most of its potential users.

Age Equivalent scores begin to address the problems of using raw scores for program evaluation purposes. The main advantage of age equivalent scores is that they typically are (or appear to be) more understandable than raw scores. It can be seen in Tables IV.5 and IV.6 that these scores have a much more common sense appeal than the raw scores, especially in those cases where parents and teachers are the primary users of the data. Despite the practical advantage age equivalent scores have, they are prone to a number of serious weaknesses that may cause one to draw erroneous conclusions about a particular program's effectiveness. First, age equivalent scores appear to be more precise than they actually are. The scores that are obtained give the impression that a particular student's, or group of students', performance can be likened to the performance of an average student at a particular age when, in reality, the norming population did not necessarily include students at each age, and instead is a score that is interpolated, or worse, extrapolated. Interpolated and extrapolated scores are far less reliable than the actual norming scores. Second, age equivalents give the impression that there are a set of

Table IV.5

A Comparison of Derived Scores on the Battelle Developmental Inventory at Des Moines.

Domain	Raw Scores Pre $\bar{X}$	Raw Scores Post $\bar{X}$	Raw Scores T*	Age Equivalent Pre $\bar{X}$	Age Equivalent Post $\bar{X}$	Age Equivalent T*	DQs Pre $\bar{X}$	DQs Post $\bar{X}$	DQs T*	Percentiles Pre $\bar{X}$	Percentiles Post $\bar{X}$	Percentiles T*	NCE'S Pre $\bar{X}$	NCE'S Post $\bar{X}$	NCE'S T*	Proportional Change Index** $\bar{X}$	Comparison Group Analysis Pre $\bar{X}$	Comparison Group Analysis Post Obs. $\bar{X}$	Comparison Group Analysis Post Ads. $\bar{X}$	Comparison Group Analysis F^{Δ}	N	Pre Age	Post Age
Personal-Social	110.04	124.04	3.36**	35.28	44.56	3.57*	75.07	78.24	-1.15	10.04	11.32	.34	13.20	16.28	.83	1.79	(T)75.07	78.24	70.30	.3055	25	48.96	63.28
																	(C)75.31	67.68	67.60		25	49.60	62.28
Adaptive	68.28	79.88	4.53*	35.36	44.84	4.28*	71.89	70.93	-.26	11.28	15.00	.75	15.04	18.20	.73	2.62	(T)71.89	70.93	67.60	8802			
																	(C)73.40	68.13	71.40				
Motor	96.88	104.36	3.96*	35.60	40.32	3.90*	72.58	63.42	-3.73*	15.00	8.16	-1.54	14.24	10.60	-1.17	1.02	(T)72.58	63.42	64.20	02693			
																	(C)74.76	65.54	64.70				
Communication	55.72	64.20	4.32*	33.52	39.28	4.14*	68.59	61.80	-3.11**	7.52	6.00	-.90	12.20	10.60	-.84	1.21	(T)65.59	61.80	60.10	1.365			
																	(C)64.46	58.31	60.00				
Cognitive	46.48	58.08	4.54*	36.44	44.16	4.65*	74.27	69.33	-1.98****	10.36	9.60	-.20	12.88	11.76	-.33	1.43	(T)74.27	69.33	67.70	1.355			
																	(C)70.43	66.37	68.00				
Total	376.48	430.28	6.0*	34.80	42.28	3.55*	71.27	66.52	-2.08***	5.48	6.28	.24	7.88	7.72	-.05	1.49	(T)71.27	66.52	66.40	.4287			
																	(C)70.87	64.32	64.50				

* $p < .001$
** $p < .01$
*** $p < .05$
**** $p < .1$

$^{\Delta}$ F scores work obtained from ANCOVA computed between the two group with each respective pretest as the covariate.

* T scores were obtained from pairwise t-tests.

** PCI's were computed as follows for each respective domain: $\frac{\text{Age equiv. gain}}{\text{Time in intervention}}$ + Pretest DQ. A score of 1.0 would be interpreted that in every month in the program, 1 month's developmental gain had occurred.

Table IV.6

A Comparison of Derived Scores on the Battelle Developmental Inventory at PITCH

	Raw Scores			Age Equivalent			DQs			Percentiles			NCE'S			Proportional Change Index**	Comparison Group Analysis						
Domain	Pre $\bar{X}$	Post $\bar{X}$	T*	Pre $\bar{X}$	Post $\bar{X}$	T*	Pre $\bar{X}$	Post $\bar{X}$	T*	Pre $\bar{X}$	Post $\bar{X}$	T*	Pre $\bar{X}$	Post $\bar{X}$	T*	$\bar{X}$	Pre $\bar{X}$	Post Obs. $\bar{X}$	Post Ads. $\bar{X}$	F$^{\Delta}$	N	Pre Age	Post Age
Personal-Social	111.85	125.00	5.0*	36.15	42.45	4.57*	76.22	78.15	.67	13.75	18.60	1.01	19.80	23.85	.89	1.26	(T)76.22 (C)76.16	78.15 81.27	78.15 81.27	.5763	20 20	48.0 46.2	54.8 53.3
Adaptive	78.90	88.50	6.60*	42.30	51.70	7.12*	88.08	94.31	2.28***	26.70	43.15	3.01**	32.10	44.00	2.78***	1.63	(T)88.08 (C)90.87	94.31 98.14	94.90 97.50	.6394			
Motor	114.20	127.35	8.21*	45.00	53.30	8.21*	94.44	97.63	1.56****	41.60	44.95	.50	44.95	45.35	.09	1.31	(T)94.44 (C)95.48	97.61 93.21	97.60 92.90	3.422****			
Communication	59.10	71.65	5.87*	35.60	44.00	5.78*	74.46	80.65	2.02****	14.75	20.00	1.10	23.40	28.90	1.38	1.78	(T)74.40 (C)79.58	80.65 86.10	82.20 84.60	.3833			
Cognitive	54.50	70.40	9.01*	42.85	51.30	4.73*	89.51	93.93	1.44	35.75	43.60	1.37	39.90	45.60	1.52	1.42	(T)89.51 (C)93.53	93.93 96.93	95.50 95.30	.0021			
Total	418.55	487.45	10.77*	39.20	48.15	10.97*	82.06	88.06	3.51**	18.05	26.95	1.74	26.30	32.05	1.60	1.60	(T)82.06 (C)84.62	88.06 89.55	89.00 88.60	.0317			

* $p < .001$
** $p < .01$
*** $p < .05$
**** $p < .1$

$^{\Delta}$ F scores work obtained from ANCOVA computed between the two group with each respective pretest as the covariate.

* T scores were obtained from pairwise t-tests.

** PCI's were computed as follows for each respective domain: $\frac{\text{Age equiv. gain}}{\text{Time in intervention}}$ + Pretest DQ. A score of 1.0 would be interpreted that in every month in the program, 1 month's developmental gain had occurred.

abilities associated with each respective age equivalent, but this is not true. In reality it is possible for two children who have successfully completed different items on the test to have the same age equivalent score. Thus, while their functional abilities may be very different, their age equivalent scores will mask this fact. Third, age equivalent scores represent the mean scores for a given age group. As a consequence, half the group actually performed below the average score for that month. Thus, a score below average is not necessarily as bad as it might seem. Fourth, one of the most serious limitations of age equivalent scores is that the units are not equal on different parts of the scale. When scores are extrapolated considerably above or below the age level for which the test was designed, a child's performance on a single test item can change the score by more than a year, while children at the age level for which the test was designed would be required to demonstrate a change in performance on many test items before a similar change in score would be evident.

When used in the fashion in which the EIPI has been designed, age equivalent scores, just as raw scores, do not account for a maturation effect. Aside from the other limitations that require one to be careful when interpreting the findings of the age equivalent scores, such as the pre-post analyses at PITCH and Des Moines, it is likely this effect may also be a function of maturation. Hence, age equivalent scores, while having a common sense appeal, are risky to use because of these fairly serious limitations.

A Developmental Quotient (DQ) is one commonly used derived score in special education settings, which is computed by dividing the age equivalent by the chronological age at the time of the test. DQ's account for the maturation effect because they are a function of each child's chronological age. They, too, are also fairly easy to interpret and, because they are readily used, may be a preferred score for this type of evaluation. Unfortunately, because DQs are based on the age equivalent scores, they suffer from the same limitations as the age equivalent scores, with the exception that DQ's do control somewhat for the maturation effect. Therefore, for purposes of a pre-post evaluation, DQ scores are likely to misrepresent the effectiveness of a program. In Tables IV.5 and IV.6 it appears that the t-tests on the DQ's show slightly lower significance levels (probably because maturation has been controlled for), even though statistically significant pre-post differences are found which are suspect, given the limitations of using these scores in this fashion.

Percentile scores are another derived score available on the Battelle. Percentile scores are an improvement over raw scores, age equivalent scores, and DQ's for use in a pre-post fashion. Since percentile scores are referenced only within a particular age group, there is no longer a problem of comparing students across age groups. Additionally, percentile scores are useful because they allow for a student's, or group of students', performance to be compared with the performance of all other students on which the test was normed. Percentiles also have the advantage of being easily interpreted, allowing teachers to see, for example, that if their children performed at the 25th percentile, they were performing equal to or better than 25% of the children on which the Battelle was normed.

As with each of the derived scores examined thus far, percentiles have several limitations that should be noted. First, percentiles do not represent equal interval units. Thus, a gain from the 50th to the 60th percentiles represents less than one standard deviation, while a gain from the 1st to the 11th percentiles represents a gain of almost two standard deviations. Unequal intervals are due to unequal frequencies at various points along the distribution of scores.

A second, although less critical, limitation of percentiles is that they are often mistakenly interpreted as percentage correct scores. As long as percentiles are used with care, then they can be a fairly accurate way of estimating how well students in a particular program have performed.

As can be seen in Tables IV.5 and IV.6, the pre-post differences that were evident with the raw scores, age equivalents, and DQ's at both the PITCH and Des Moines sites are no longer evident when examining percentiles. While DQ's and percentiles, which are both derived from the same norming population and controlling for maturation, should theoretically produce similar pre-post findings, these results represent slightly contradictory results. This is likely due to the fact that percentiles are referenced only to students in a particular age group rather than across age groups, as are age equivalent scores and DQ's. Nevertheless, the main weakness of percentiles are their unequal intervals.

In response to the limitations of unequal intervals in percentiles, Normal Curve Equivalent (NCE) scores were developed that would adjust the intervals. Thus, NCE's are derived from percentiles, and, in addition to possessing the same advantages of using percentiles, NCE's have controlled for problems due to unequal intervals (i.e., a gain from NCE 50 to NCE 60 is equal to a gain from NCE 1 to NCE 11). The main disadvantage of using NCE's for purposes of the EIPI is that very few people know what NCE's are and how to interpret them. Provided that the correction provided by the NCE adjustment over the percentile is critical, NCE's are a very good way of estimating child performance in a program. As can be seen in Tables IV.5 and IV.6, however, the adjustment NCE's provided over percentiles appeared to be negligible. Thus, it is doubtful whether the added precision NCE's provide would be worth the risk of faulty interpretations of the scores that are likely since few teachers and parents have experience with using them.

Aside from using the derived scores discussed above in evaluating in a pre-post fashion the effects of an early intervention program, another technique that has been advocated is the use of efficiency indices (Bagnato & Neisworth, 1980; Simeonsson & Wiegerink, 1975; Simeonsson, 1982; Wolery, 1983). In her comparison of three commonly used indices, Prater (1984) suggests Wolery's Proportional Change Index

(1983) as a "middle of the road" index to use in program evaluation. It is computed as follows:

$$\text{PCI} = \frac{\text{Age Equivalent Gains}}{\text{Time in Intervention}} \div \frac{\text{Pretest Developmental Age}}{\text{Pretest Chronological Age}}$$

PCI scores are not statistically tested. Rather, these scores are used to estimate how much progress was made for every month in the program (i.e., a score of 1.0 would be interpreted as follows: for every month in the program, 1 month's develo8pmental gain had occurred). As can be seen in Tables IV.5 and IV.6, both PITCH and Des Moines showed overall gains of greater than 1, meaning that the children were supposedly progressing a rate beyond their expected maturation rate. Once again, these scores alone would lead one to conclude that each program was quite effective. One limitation of PCI scores, however, is that it is difficult to determine how large a score reflects a meaningful pre-post difference, since no statistical test can be done. Additionally, PCI's are prone to the same problems as the age equivalent and DQ scores upon which they are based.

Comparison Group Analysis

As is shown in Tables IV.5 and IV.6, an additional analysis was conducted with each site using their respective comparison groups. It is important to note that whenever an evaluation is conducted, there is, at least, an implicit comparison being made. This is especially important in the case of the EIPI in which the relationship between the costs and effects of programs are intended to be demonstrated. Cost effectiveness analysis is, by definition, a comparison of two or more program alternatives. Therefore, it is important to examine the difference in conclusions that might be drawn depending not only on which scores are used, as has just been done, but whether a pre-post design or a randomized control group design is used.

Since the randomized control group design is widely accepted as the more rigorous design, the findings of this analysis carry more weight than those of the pre-post comparison. It should be noted that ANCOVA's (using pretest scores as covariates for each domain) were computed for each of the derived scores. ANCOVA's on each type of score produced similar results showing relatively no significant differences between the groups. Therefore, these findings substantiate the earlier indication that of all the derived scores, percentiles used in a pre-post design came closest to portraying the finding of the randomized control group design.

Tables IV.5 and IV.6 include the ANCOVA computed on the DQ scores only. Since the limitations of DQ scores no longer present serious problems when using a randomized control group design, and since DQs are more readily understood and used by teachers and parents, it was determined that DQ's be used in the comparative design analyses reported here. (ANCOVA's were also completed on each of the other scores in each domain and resulted in comparable findings.) From these analyses, it can be concluded, as would be expected, that pre-post evaluation designs must be used with great caution, because there are many alternative explanations for any noticeable differences that might be found. The results of these analyses support the need for comparison groups to lend more credibility to the interpretation of evaluation results. Furthermore, when attempting to demonstrate the relationship between costs and effects, a comparison group is vital. Without a comparison group, costs can be described, as can effects, but conclusions about cost effectiveness must be tentative at best.

Description of Costs

Cost data collection procedures were pilot tested with a small sample of public school programs in 1987-88. Three early intervention programs, two in Utah and one in Iowa, participated in the pilot test. One program in Utah and the Iowa program had both a center- and a home-based model that operated separately, while the other Utah program was center-based only. All programs served children with mild to severe handicaps and served preschool-aged children (3- to 5-year-olds), except the home-based model in Iowa, which served children aged birth through 2.

Development of a system to collect accurate cost data in a brief and easy-to-use format, which is also general enough for the wide variety of early intervention programs currently serving children, represented a considerable challenge. Trade-offs between the amount of detailed information to be gathered and reporting burdens on program personnel were necessary. The cost data collection system used by EIRI in its longitudinal research studies collects an extensive amount of highly complex information for use in in-depth economic analysis. To collect this information, we relied on a detailed set of data collection forms and extensive interaction between the collaborating sites and EIRI economists. Although this system is proven, we were not certain that a streamlined version of it would be suitable for large-scale data collection efforts anticipated by the Office of Special Education regarding the costs of early intervention programs for children with handicaps. Thus, we developed a second, simpler alternative and pilot tested both instruments.

The data collection instrument based on the EIRI protocols was adapted for independent, rather than interactive, use with programs. This instrument requires the director or other administrator of a program to compile an exhaustive list of the resource inputs into their programs and to determine the costs associated with them. This includes an extensive description of program personnel and the costs (salary plus benefits) associated with each staff person as well as descriptive information on all nonpersonnel resources. In our longitudinal research studies, EIRI staff were available to assist in every stage of the process. The cost forms were returned to EIRI for completion and analysis. Some steps in cost estimation were performed by EIRI for the sites: EIRI staff estimated the dollar value of volunteer time and the annual cost of capital such as facilities and equipment (see Section I for more information on the longitudinal studies' cost analyses).

In the pilot test, all steps in the cost data collection process were conducted independently by each program, since we considered it likely that no national resource would be available to provide technical assistance in cost reporting on a large scale. Thus, instructions were developed and included on the data collection forms for such things as determining the value of volunteer time, annualizing capital costs, and completion of the analysis to arrive at total program cost and cost per child. Programs were required to complete a set of forms for each model of service delivery offered by their program (e.g., home-based, center-based, etc.).

The second instrument, which was adapted from Rand's work, was also designed for independent use by program personnel and followed the ingredients approach. However, it is much shorter and requires considerably less effort by program staff to complete. The forms consist of a one-page list of resource categories and one page of instructions (see Appendix B). No details are requested in these forms for individual program personnel or nonpersonnel items. As in the EIRI-based instrument, participants in the pilot test provided a total cost and a cost per child for each resource category used by the program as well as for each model of service delivery. Broad resource categories include: instruction (direct service), administration, supplies, materials and equipment, transportation, facilities, miscellaneous, donations, and volunteers. Thus, three early intervention programs were contacted to complete the forms. Site personnel were allowed up to 2 days of consulting time (at their respective rates). They were required to complete the short form first and then the long to insure that costs were calculated separately for each method and not simply transferred from the more detailed long forms to the short forms.

Results indicated that the short forms provided adequate information for use as a measure of the overall cost per child by major resource category. It will be especially suitable for public school special education programs, because its categories follow those that are familiar to public school administrators. The EIRI-based instrument was both difficult and confusing for staff to complete on their own. While the more detailed method could have provided better information, without assistance, it actually provided less information, because the programs did not complete it properly. The shorter forms are at a disadvantage, because they do not provide data on capital costs in the most accurate form. However, they provided information on annual capital expenditures that is adequate for rough cross-program comparisons, and, in any case, capital costs are a relatively small percentage of total cost. Overall, the short form was both relatively easy to complete and provided the best data.

CONCLUSION

The first purpose of the EIPI was to provide a useful system for identifying trends in current early intervention program practices. The three phases of development of the EIPI have demonstrated that the EIPI can be used to very adequately describe the components of programs, the nature of participating children and their families, and, within a small margin of error, the costs of programs. To collect the minimum amount of information to meaningfully address these areas, as is included in the EIPI, program providers must spend between 2 to 4 hours completing the forms. For some providers, the time required seemed somewhat unreasonable; nevertheless, program providers admitted that the information required by the EIPI was necessary in order to depict the nature of a particular program and that each form is, in fact, easily completed.

The second purpose of the EIPI is to provide a system that can determine, without the use of control or comparison groups, if certain types of programs are more cost effective than other types of programs. As has been demonstrated, the norm-referenced evaluation model using the Battelle Developmental Inventory can most accurately be used if percentile ranks are obtained on each of the domains of the Battelle. Despite the advantages of using the percentiles over other derived scores available on the Battelle, these scores do not sufficiently compensate for the threats to validity inherent in the norm-referenced model. As has been shown, the results of the norm-referenced model often contradicted the finding of the randomized control group design, which is generally accepted as a more rigorous evaluation design, using the same sample populations. As a result, it is recommended that in order to accurately evaluate the cost effectiveness of early intervention programs using the Battelle as the primary outcome measure, systematic variations of programs must be done that incorporate random assignments to alternative intervention strategies. Without the rigor of randomized control or comparison group designs, the results of wide-range evaluations of the cost effectiveness of early intervention programs must be used with great caution.

V. REPORT ON THE ADVISORY COMMITTEE

On November 23-24, 1987, the Longitudinal Studies Project Advisory Committee met in Washington, DC. Out of a possible 20 topics proposed by project staff, the committee chose 8 to discuss at the meeting. In a series of large and small group discussions, project staff presented information and requested advice from the committee. The agenda and minutes for the meeting are attached. The minutes consist of a summary of each discussion, and they close with the recommendations of the committee.

The following individual advisory committee members have also been contacted on occasion to assist with concerns within their specific areas of expertise:

- Bud Fredericks provided a day of consultation to four project staff on the On-Site Evaluation Procedures, on methods for classifying handicapped children, and on relations with the advisory committee as a whole. A complete revision of the On-Site Evaluation Procedures resulted from this meeting as well as refinement of the classification process.
- Diane Bricker provided valuable assistance to the project on a number of topics. She consulted with staff on a description of personnel preparation, suggested appropriate complementary outcome measures for the Sunshine/Richardson site, and assisted with the program outcomes questionnaire.
- Steve Warren consulted with project staff on complementary measures, as well as accompanying Chuck Lowitzer to Phoenix to review the planned intervention at that site and give suggestions on the HCEEP proposal they were preparing.
- Craig Ramey and Dick Darlington were both contacted regarding a statistical analysis issue.

VI. GRADUATE STUDENT TRAINING

The Longitudinal Studies Project has attracted graduate students with diverse backgrounds, from a wide variety of disciplines, and representing various cultures, races, and nationalities. Students working on the project are completing degrees in clinical psychology, developmental psychology, analysis of behavior, special education, family and human development, sociology, instructional technology, communication disorders, and economics. They have had professional experiences such as teaching, therapy, college instruction, pharmacy, classroom supervision, media specialist, and research. They come from all over the United States and the world. Their supervised experiences in the Longitudinal Studies Project have ranged from devising coding schemes for data collection to completing data analysis and have included scholarly work such as literature reviews and paper presentations at national conferences. A total of nine dissertations are in process or have been written with project data.

Table VI.1 lists each graduate student by name, discipline, and prior degrees. In addition, a brief description of their individual experiences is given. All graduate students have also completed the interdisciplinary training offered by the Developmental Center for Handicapped Persons, which entails progressing through 12 modules on special education and attending optional lectures on topics such as "Using Economic Analyses in Research" or "Expert Systems in Special Education." Also, the Early Intervention Research Institute staff have conducted training for many of the graduate students in administration and scoring of test batteries, data analyses for the longitudinal studies, data monitoring, and computer skills.

Table VI.1

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
Bob Bailey	Clinical Psychology, Ph.D	BS Brigham Young University MS Henderson State University	* Score and administer tests * Conduct telephone surveys * Assist in literature reviews * Analyze data
Bill Corey	Clinical Psychology, Ph.D	BA University of Missouri MS Utah State University	* Grant writing * Oversee IVH follow-up study * Data analysis * Preparation of scholarly articles * Presentation at national conference
Ellen Frede	Developmental Psychology, Ph.D	BA University of Michigan MA Pacific Oaks College	* Revise treatment verification and on-site evaluation procedures * Liaison with advisory committee * Grant writing * Assist in writing of 2 books, 3 articles * Presentation at national conference * State coordinator for Child Care Action Campaign
Kwisun Huh	Developmental Psychology, Ph.D	BA Seoul Women's University MA Seoul Women's University	* Supervision of clerks * Data analysis * Check scoring of tests * Three conference presentations * Preparation of scholarly articles * Preparation of literature reviews * Assist in manual preparation
Nancy Immel	Family & Human Development, M.S.	BA Sacramento State College BS Colorado State University	* Coordination of Medicaid Consortium * Site coordination * Develop database of subjects * Grant writing
Mark Innocenti	Analysis of Behavior, Ph.D	BS Northeastern University MS Utah State University	* Oversee work of clerks and other students * Site coordination * Data analysis * Preparation of 4 articles, 1 book chapter, 1 book * Presentations of national, state, and local conferences * Grant writing
Helal Mobasher	Sociology, Ph.D	BA Utah State University MS Utah State University	* Supervision of computer files * Computer consultant for all staff * Presentation at national conference * Preparation of scholarly articles * Preparation of literature reviews
Vanessa Moss	Research and Eval. in Psychology, Ph.D	BS Brigham Young University MS Brigham Young University	* Coding, checking, and analyzing studies for integrative review * Literature review
Anuradha Parthasarathy	Research and Eval. in Psychology, Ph.D	BA National College, Bangalore, India	* Coding, checking, and analyzing studies for integrative review
Darrell Peatross	Instructional Technology, M.S.	BS Utah State University	* Writing research reports * Data analysis * Assist in designing course work * Grant preparation * Article preparation

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
Arunoday Saha	Economics, Ph.D	BS Calcutta University MS Calcutta University	* Data analysis * Collection and analysis of cost data * Develop methodology for analyzing quasi-experimental data * Literature reviews
Pam Sapyta	Sociology, M.S.	BS Utah State University	* Collect, code, and analyze data
Eun-hee Shin	Psychology, M.S.	BS Ewha University, Korea	* Collect, code, and analyze data * Literature reviews
Carl Summers	Research and Eval. in Psychology, Ph.D	BS Brigham Young University MS University of Utah MA University of Nebraska	* Grant writing * Analysis of data
Marcia Summers	Developmental Psychology, Ph.D	BS Brigham Young University MS University of Nebraska	* Site management * Coordinate coding of parent/child interaction tapes * Grant writing * Paper presentations at local, regional, and national conferences * Three scholarly publications
Matt Taylor	Research and Eval. in Psychology, Ph.D	BS Utah State University MS Utah State University	* Code, analyze studies for integrative review * Grant writing
Teri Wingate-Corey	Clinical Psychology Ph.D	BS Weber State University MA University of Missouri	* Site coordination * Grant writing * Data analysis * Grant and article preparation * Paper presentation at national conference
Jyme Waidler	Communications M.S.	BA California State Univ. at Hayward	* Data analysis * Checking test protocols * Consultation on videotaping
Bernie Wazleveck	Clinical Psychology Ph.D	BA Western Maryland College MA Towson State University	* Data analysis * Data management * Coordination of data collection * Grant writing
Claudia Weber	Developmental Psychology, M.S.	BS University of Minnesota	* Score tests * Data analysis * Oversee clerks * Literature review

As can be seen, the wide variety of experiences encountered by the 20 graduate students in the project far exceeds the requirements of the original contract. Beyond training students employed by the project, project staff have served as guest lecturers in various classes, provided consultation to other students on their research, and taught courses in many departments. In addition, the project co-sponsored a week-long institute on infancy and early childhood. Attended by over 40 students, the institute included the following speakers of national renown: Fran Horowitz, Deborah Vandell, Marion Radke-Yarrow, Sanford Zeskind, and Nancy Eisenberg.

VII. DISSEMINATION

Staff on the Longitudinal Studies Project have been extremely productive this year. Seven books, 22 book chapters, and 34 scholarly articles have been written. Of these, 23 are published, 34 are in press, and 6 have been submitted for review. In addition, presentations have been made at 9 international, 30 national, 6 regional, and 25 state level conferences, including conferences of the Division of Early Childhood, the Council for Exceptional Children, the Third International Interdisciplinary Congress on Women, the AAUAP, the American Educational Research Association, the Western Economics Association, the Society for Pediatric Research, International Conference on Infant Studies, the Association for Childhood Education International, the International Down Syndrome Congress, and the 8th International Congress of the International Association for the Scientific Study of Mental Deficiency.

Additional evidence of the importance of the work of the Longitudinal Studies is provided by the estimated 750 requests for publications that have been sent to the project this year. Another avenue of dissemination is consultations. Staff have provided information regarding research designs, statistical methods, teaching practices, therapy, parent involvement, child assessment, economic analysis, and review of the research to practitioners, other researchers, and public leaders. These have included the state departments of education in South Carolina, Florida, Virginia, Massachusetts, Utah, Connecticut, Minnesota, Illinois. California, New York, and Arizona; the offices of Senators Orrin Hatch, Lowell Weicker, Edward Kennedy, Chris Dodd, Tom Harkins, and Congressman Wayne Owens; the Utah State Legislature; the National Council of State Governments; and researchers in such diverse locations as Germany, China, and Ecuador, as well as throughout the United States.

Publications of initial analyses of the longitudinal studies should increase during the coming year, as many of the studies now have complete pre- and posttest data for all of the subjects. On the advice of the advisory committee, we have postponed any publication of preliminary analyses until complete data were available at a given site. Complementary presentations will be made at regional and national conferences.

Publications for 1988 Fiscal Year

Austin, A. M. B., Summers, M., & Leffler, A. (1987). Fathers' and mothers' involvements in sibling communication. Early Childhood Research Quarterly, 2, 359-365.

Barnett, W. S. (1988). A cross-cultural investigation of economics and mental retardation. In S. C. Hey (Ed.), Proceedings of the Society for Disability Studies. Salem, OR: Willamette University.

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Presentations for 1988 Fiscal Year

Austin, A. M. B., Summers, M., & Leffler, A. (__________). Father's and mother's involvements in sibling communication. Paper presented at the Third International Interdisciplinary Congress on Women, Dublin, Ireland.

Barnett, W. S. (1987, October). Funding and funding mechanisms: The economics of the child care industry. Paper presented at the Working Forum on Public Schools and Prekindergarten Programs, New York, NY.

Barnett, W. S. (1987, October). The quality of residential care: A historical and economic perspective. Presented at the annual AAUAP Conference, Kansas City, MO.

Barnett, W. S. (1987, November). Economics of state preschool policy options under P.L. 99-457. Paper presented at the Council for Exceptional Children's National Conference on the Future of Special Education, Orlando, FL.

Barnett, W. S., & Casto, G. (1988, June). Cost effectiveness of early intervention: Methodology, U.S. findings, and an international perspective. Paper presented at the International Conference on Special Education, Beijing, PRC.

Barnett, W. S., & Escobar, C. M. (1988, August). Time use, well-being, and function in families of children with Down syndrome. Paper to be presented at the International Association for the Scientific Study of Mental Deficiency, Dublin, Ireland.

Barnett, W. S., & Frede, E. C. (1988, April). Longitudinal effects of public preschool programs. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Behl, D., Peterson, A., & Summers, M. (1987, November). Evaluating treatment outcomes through videotaped assessment procedures. Paper presented at the Conference of the Division for Early Childhood, Denver, CO.

Casto, G. (1987, September). Presentation of the MAPPS model. Presented at the Workshop on Early Intervention, Anchorage, AK.

Casto, G. (1988, February). Home visitor programs: Evidence of effectiveness. Paper presented at the National Conference on Family Support in the Home, Honolulu, HI.

Casto, G., & Innocenti, M. S. (1988, June). Assessment of children from birth to 5. Workshop presented at the Nevada Office of Education, School Psychologists Summer Institute, University of Nevada, Reno, NV.

Eiserman, W. D. (1988). Reaction panel member. Spring Conference on Deafness, Little Rock, AR.

Eiserman, W. D., Lowitzer, A. C., & Rittenhouse, R. (1988, April). Two longitudinal studies on the efficacy of early intervention with hearing impaired children and their families. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Eiserman, W. D., & Williams, D. D. (1988, April). Evaluating interactive videodisc programs: Lessons learned in applying methods. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Escobar, C. M. (1988, January). Transportation costs and options for preschool children with handicaps in the State of Utah. Testimony presented at the Utah State Office of Education Preschool Conference, Salt Lake City, UT.

Escobar, C. M. (1988, March). The cost of transporting preschool children under P.L. 99-457: Utah's pilot programs. Paper presented at the Utah State Office of Education Preschool Conference, Salt Lake City, UT.

Escobar, C. M., & Barnett, W. S. (1987, November). How much do parents value early intervention: New methods and findings from benefit-cost analysis. Paper presented at the Council for Exceptional Children, Division of Early Childhood National Early Childhood Conference, Denver, CO.

Escobar, C. M., & Barnett, W. S. (1987, July). A contingent valuation approach to measuring the benefits of preschool education. Paper presented at the Western Economics Association Annual Conference, Vancouver, Canada.

Escobar, C. M., Barnett, W. S., & Haring, K. (1988, April). Measuring the benefits of preschool special education: The contingent valuation method. Paper presented at the American Educational Research Association Annual Conference, New Orleans, LA.

Escobar, C. M., Barnett, W. S., & Haring, K. (1988, August). A contingent valuation approach to measuring the benefits of public programs for the handicapped. Paper to be presented at the International Association for the Scientific Study of Mental Deficiency, Dublin, Ireland.

Fiechtl, B., & Innocenti, M. (1987, September). Training parents to be informed advocates for their handicapped preschoolers. Presented at the annual meeting of the Utah Federation, Council for Exceptional Children, Park City, UT.

Gorski, P. A., & Huntington, L. (1988, April). The effects of handling on physiological stability in hospitalized preterm infants. Paper presented to the biennial meeting of the International Conference on Infant Studies, Washington, DC.

Gorski, P. A., & Huntington, L. (1988, May). Physiological measures relative to tactile stimulation in hospitalized preterm infants. Paper presented to the Society for Pediatric Research, Washington, DC.

Gorski, P. A., Huntington, L., Pope, J. A., & Saylor, C. F. (1988, March). Coding interactions between handicapped infants and their mothers. Paper presented to the Southeastern Psychological Association, New Orleans, LA.

Haring, K., Behl, D., & Escobar, C. M. (1987, May). The Early Intervention Research Institute: An overview. Paper presented at the Utah State Council for Exceptional Children Fall Conference, Park City, UT.

Healy, A., Smith, B., White, K. R., Innocenti, M., Guralnick, M., & Hohlstein, R. (1988). Mapping the future for children with special needs: P.L. 99-457. Iowa City: University of Iowa.

Huntington, L. (1988, March). Psychologists and their preschool handicapped: Implications of P.L. 99-457. Paper presented to the Southeastern Psychological Association, New Orleans, LA.

Huntington, L., & Gorski, P. A. (1988, April). Temporal relations between preterm infant behavior and physiological distress. Paper presented to the Society for Pediatric Research, Washington, DC.

Huntington, L., & Gorski, P. A. (1988, April). The relation of preterm infant behaviors to physiological distress. Paper presented to the biennial meeting of the International Conference on Infant Studies, Washington, DC.

Huntington, L., Hans, S., & Zeskind, P. S. (1988, March). Cry features, NBAS scores, and demographic features as predictors of developmental progress in methadone exposed infants. Paper presented to the meeting of the Southeastern Psychological Association, New Orleans, LA.

Huntington, L., Hans, S., & Zeskind, P. S. (1988, April). The predictive utility of cries in group of low-SES methadone exposed infants. Paper presented to the biennial meeting of the International Conference on Infant Studies, Washington, DC.

Huntington, L. M. (1987, December). Issues in personnel preparation in Utah. Presented to the Utah State Office of Education Preschool Steering Committee, Salt Lake City, UT.

Huntington, L. M. (1988, March). Child development: 0-5 normal and atypical development. Presented at the Utah State Office of Education Preschool Conference, Salt Lake City, UT.

Huntington, L. M. (1988, June). Is my child normal--speech and language development in the preschool years. Presented at the Utah State Institutional Early Childhood Education Conference, Logan, UT.

Huntington, L. M. (1988, June). Reactions to the birth of a child with Down syndrome. Presented at the Research and Practice in Down Syndrome, Logan, UT.

Immel, N. (1988, March). Research of the Early Intervention Research Institute. Presented at the Early Intervention Conference, Denver, CO.

Immel, N. (1988, June). Is this child normal? Tips for telling motor skills. Presented at the Utah Inter-Institutional 13th Annual Early Childhood Conference, Salt Lake City, UT.

Innocenti, M. S. (1988, March). Strategies for transition. Paper presented at the Utah State Office of Education Preschool Conference, Salt Lake City, UT.

Innocenti, M. S. (1988, March). Teaching social skills to behaviorally disordered students. Paper presented at the Wind River Council for Exceptional Children, Lander, WY.

Innocenti, M. S. (1987, July). A survey of training emphasis in early intervention preservice programs. Paper in session Promising Practices for Preparation of Infant Personnel (Preservice) at Partnerships for Progress II: Comprehensive Services for Infants and Toddlers with Special Needs and Their Families, Washington, DC.

Innocenti, M. S., & Fiechtl, B. (1987, September). Training parents to be informed advocates for their handicapped preschoolers. Paper presented at the Utah Council for Exceptional Children Conference, Park City, UT.

Innocenti, M. S., & Fiechtl, B. (1988, April). Involving parents in teaching social skills to their handicapped preschoolers. Paper presented at Association for Childhood Education International, Salt Lake City, UT.

Innocenti, M. S., Fiechtl, B., & Rule, S. (1988, May). Teaching academic survival skills during group activities. Poster presentation at the annual Association for Behavior Analysis Conference, Philadelphia, PA.

Lowitzer, A. C. (1987, October). Institutional and community program spending patterns and characteristics of states grouped by mental retardation classification system in use. Paper presented at the annual AAUAP Conference, Kansas City, MO.

Lowitzer, A. C. (1987, November). Critical issues in transition and their implications for the future. Symposium presented at the National Conference on the Future Use of Special Education, Orlando, FL.

Lowitzer, A. C., Melmed, R., & Cherne, L. (1987, November). A model early intervention program for 0-3 victims of severe trauma, near drowning, or severe meningitis. Paper presented at the National Early Childhood Conference on Children with Special Needs, Denver, CO.

Rowland, C., & Behl, D. (1987, September). A whole person orientation: Functional activities in meaningful contexts. Presented at the Utah Federation, Council for Exceptional Children Conference, Park City, UT.

Saylor, C., Pope, J., Casto, G., & Summers, M. (1987, November). Practical issues in longitudinal research. Paper presented at the Conference of the Division for Early Childhood, Denver, CO.

Summers, C., & Summers, M. (1988, June). Assessment for preschool children. Paper presented at the Utah Inter-Institutional Early Childhood Education Conference, Salt Lake City, UT.

Summers, M. (1987, November). Math and science in research with young children. Presented at the Expanding Your Horizons Conference, Utah State University, Logan, UT.

Summers, M., Austin, A. M. B., Schvaneveldt, J., & Lindauer, S. K. (1988, March). Parenting practices and preschooler's prosocial behavior: An analysis of gender differences. Paper presented at the biennial conference of the Southwestern Society for Research in Human Development, New Orleans, LA.

Summers, M., & Huntington, L. (1988, March). Coding interactions between handicapped infants and their mothers: Preliminary comparison of five systems. Paper presented at the conference of the Southeastern Psychological Association, New Orleans, LA.

Summers, M., Huntington, L., Immel, N., & Weber, C. (1988, June). Is this child normal? Tips for telling. Paper presented at the Utah Inter-Institutional Early Childhood Education Conference, Salt Lake City, UT.

Tingey, C. (1987, August). Family counseling: The S.O.F.T. touch. Presented at the Annual Conference of the Support Organization for Trisomy, Salt Lake City, UT.

Tingey, C. (1987, September). Social skills to avoid isolation. Presented at the Central Illinois Down Syndrome Congress Conference, Bloomington, IL.

Tingey, C. (1987, September). Social skills to avoid isolation. Presented at the International Down Syndrome Conference, Mexico City, Mexico.

Tingey, C. (1987, September). Teaching skills at home. Presented at the International Down Syndrome Conference, Mexico City, Mexico.

Tingey, C. (1987, November). Middle class single parenting. Presented to the National Down Syndrome Congress, Washington, DC.

Tingey, C. (1987, November). Sisters and brothers. Presented to the National Down Syndrome Congress, Washington, DC.

Tingey, C. (1987, November). Statement of family needs--from experience rather than speculation. Paper presented at the Division of Early Childhood Annual Conference, Denver, CO.

Tingey, C. (1987, November). What early intervention provides for parents. Presented to the Child Development Resource Organization, Lightfoot, VA.

Tingey, C. (1988, February). Results of research in parental support in early intervention. Paper presented at the Louisiana Super Conference, Lafayette, LA.

Tingey, C. (1988, February). Results of research in parental support in early intervention. Paper presented at the Down Syndrome Project, Baton Rouge, LA.

Tingey, C. (1988, April). Parenting a handicapped child. Presented at the State Conference on the Hearing Impaired, Little Rock, AR.

Tingey, C. (1988, May). Cultural and geographic differences in assessment. Presented to the American Association of Mental Retardation, Washington, DC.

Tingey, C. (1988, May). Developmental study of triplets, one of whom has Down syndrome. Presented to the American Association of Mental Retardation, Washington, DC.

Tingey, C. (1988, May). Parent component in early intervention. Presented at Mercer County School District, Trenton, NJ.

Tingey, C. (1988, May). Update on the longitudinal studies of the effectiveness of early intervention. Presented to the American Association of Mental Retardation, Washington, DC.

Tingey, C. (1988, June). Implementing early intervention. Presented at the Wyoming State Department of Health and Social Services, Casper, WY.

Tingey, C. (1988, June). Parental experience in early intervention and implementing early intervention. Presented to the Wyoming State Department of Health and Social Services, Casper, WY.

Tingey, C., & Gumucio, B. (in press). Analysis of mother/child interaction with and without Down syndrome. Paper submitted for publication.

Tingey, C. (in press). Handling the growing-up years: Educational psychology in the middle grades. *Early Years K-8*.

Tingey, C. (in press). How to make/write a referral for a child who is suspected of being handicapped. *Early Years K-8*.

Tingey, C. (in press). Mini classes for middle school. *Learning K-12*.

Tingey, C. (in press). *Monograph up, up, and away*. To be published by the National Down Syndrome Congress.

Tingey, C. (in press). What are friends for? *Learning K-12*.

Victor, J. B., Rule, S., Fiechtl, B. J., & Innocenti, M. S. (1987, November). *From the broad to the specific: Social interaction assessment and programming strategies*. Panel presentation at the National Early Childhood Conference on Children with Special Needs, Denver, CO.

White, K. R. (1987, July). *Early intervention with hearing impaired children*. Invited presentation to the SKI*HI Institute National Conference, Logan, UT.

White, K. R. (1987, July). *Understanding the potential and pitfalls of early intervention: Lessons from research*. Invited address to the annual meeting of the Phoenix Society of Pediatrics, Phoenix, AZ.

White, K. R. (1987, November). *Longitudinal research on the effects and costs of early intervention with handicapped children*. Invited paper presented at the National Early Childhood Conference on Children with Special Needs, Denver, CO.

White, K. R. (1987, November). *Methodological issues in research integration of special education research*. Paper presented at the annual meeting of the Council on Exceptional Children, Chicago, IL.

White, K. R. (1988, March). *Using systematic variation to improve intervention programs*. Paper presented at the Utah Preschool Education Conference, Salt Lake City, UT.

White, K. R. (1988, April). *Current policies and procedures in serving birth to 2 handicapped children*. Keynote address to the annual meeting of the Minnesota Administrators of Special Education, Shakopee, MN.

White, K. R. (1988, July). *Financing early intervention programs*. Paper presented at Partnerships for Progress II, Washington, DC.

White, K. R., & Immel, N. (1988). *Financing early intervention for handicapped infants, toddlers, and preschoolers*. Logan, UT: Early Intervention Research Institute.

Wingate-Corey, T., Casto, G., Chan, G., & Dolcourt, J. (1988, February). *The effectiveness of an early sensorimotor intervention on the development of infants with perinatal intraventricular hemorrhage*. Presentation given at the Western Pediatric Research Society meeting in Carmel, CA.

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Als, H., Lawhon, G., Brown, E., Gibes, R., Duffy, F. H., McAnulty, G., & Blickman, J. G. (1986). Individualized behavioral and environmental care for the very low birth weight preterm infant at high risk for bronchopulmonary dysplasia: Neonatal intensive care unit and developmental outcome. *Pediatrics*, *78*, 1123-1132.

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Arnold, K. S., Myette, B. M., & Casto, G. C. (1986). *Relationship of language intervention efficacy to selected pretreatment subject characteristics in mentally retarded and language disordered children: A meta-analysis*. Utah State University: Early Intervention Research Institute, Logan, Utah. *ETMR June*, 108-116.

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Bailey, E. J., & Bricker, D. (1984). The efficacy of early intervention for severly handicapped infants and young children. *Topics in Early Childhood Special Education*, *4*, 30-51.

Bailey, R. J., & Simeonsson, R. (1986). Siblings of handicapped children. In J. J. Gallagher, & P. M. Vietze (Eds.), Families of handicapped persons (pp. 67-77). Baltimore, MD: Brookes Publishing.

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Bailey, D., Simeonsson, R., Isabell, P., Huntington, G., Winton, P., Comfort, M., & Helm, J. (1988). Inservice training in family assessment and goal setting for early interventionists: Outcomes and issues. Journal of the Division for Early Childhood, 12, 126-136.

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Appendix A

Guidelines for Interpreting EIRI Outcome Measures

Appendix A

Guidelines for Interpreting EIRI Outcome Measures

Child Outcome Measure: The Battelle Developmental Inventory (BDI)

The BDI is a standardized assessment tool which was nationally normed on approximately 800 children from varying geographical locations, with the distribution of the sample by race and sex reflecting the characteristics of the U.S. population. Raw scores for the BDI can be converted to several different standard scores; two of the most used scores are "age equivalents" and "deviation quotients".

Age equivalent scores indicate the age at which a raw score is *average*. For example, in the Adaptive Domain, a raw score of 56 has an age equivalent score of 25 months. This means that a score of 56 is the average score for 25-month-old children. One problem with age equivalent scores is that they are not based on equal intervals, since the variability in the rate at which a child develops is not uniform in terms of performance. Additionally, an age equivalent score is only useful in estimating the child's level of functioning if the child's chronological age is known and then compared to his/her age equivalent score. Therefore, although age equivalent scores are useful in communicating test results to others, e.g. parents, a standard score is needed to make precise comparisons and conclusions about degree or amount of difference or change.

A deviation quotient is one of the most frequently used standard scores. A deviation quotient (DQ) reflects how far a child's performance is from the mean. The mean for a DQ is 100, with a standard deviation of 15. For example, a DQ of 85 is defined as performing 1.00 standard deviations (15 points) below the mean of 100. DQ scores also allow for determining how different performance is in one domain compared to another.

The normative tables provided in the Battelle manual which are used to determine DQ scores only report scores 2.33 standard deviations above and below the mean, or, from a DQ of 65 to 135. Many of the children in the EIRI studies, due to their degree of developmental delay, perform below 2.33 standard deviations from the mean. Thus, since DQ scores have not been provided for children performing so far from the mean, the standard scores based on the BDI's normative sample do not allow for comparisons to be made with most of the children in the EIRI studies.

For descriptive and comparative purposes, EIRI has applied an alternative procedure for reporting DQ scores. The DQ scores reported in the site description tables were calculated by dividing the child's age equivalent score by the child's chronological age, and is also based on a mean of 100. For example, a child who is 24 months old and functioning at a 12-month level would receive a DQ of 50.

EIRI has discussed the problem of inadequate standard scores for use in evaluating handicapped children with the publishers of the Battelle Developmental Inventory. Although it appears that no immediate action will be taken to improve the standard score tables, plans for a renorming of the test in the future were mentioned.

Family Measures

Procedures were implemented to facilitate the interpretation of scores on the family measures. For some of the family measures, normative data were nonexistent. Therefore, EIRI has calculated percentiles for the various family measures based on the procedures described below. Site descriptions include percentiles in reporting mean scores in their pre- and posttest tables, although the analyses were conducted using raw scores. These percentiles are provided at the end of this section.

Parenting Stress Index (PSI)

Percentile ranks on the PSI were reported in the manual in increments of five, based on the raw scores. To obtain more discrete percentile scores, the norming tables from the manual were interpolated (e.g. dividing the difference in raw scores between the first and fifth percentile by five, and then calculating the derived raw score for the second, third, and fourth percentile) in order to obtain percentile ranks in units of one.

Family Resource Scale (FRS) and Family Support Scale (FSS)

Although these scales were developed for use with families of handicapped children, no normative scores were available. To interpret the raw scores more meaningfully, percentile ranks for these measures were calculated based on frequency measures of pretest data collected on all families enrolled in the EIRI longitudinal studies. This allows the mean scores of groups to be compared to a nation-wide sample population of families with handicapped or at-risk children.

Family Inventory of Life Events and Changes (FILE)

Percentiles for the FILE were obtained from the author's national norms based on approximately 1,960 individuals. This sample includes couples across the family life cycle from young married couples to those retired.

Family Adaptability and Cohesion Scales (FACES III)

Scores on the main variables of adaptability and cohesion were computed by taking the median point reported in the manual (the median point being the optimum score) and subtracting the score received by each family, using the absolute value for negative results. Thus, the scores obtained in these domains represent distances from the ideal. The total FACES score is a sum of the adaptability and cohesion distances. The discrepancy score is obtained by calculating the difference between how the respondent perceives their family to be functioning in reality and how the respondent would ideally like their family to be operating. Thus, the discrepancy score can be interpreted as the respondent's degree of satisfaction with their family functioning, with a lower discrepancy score representing greater satisfaction.

PARENTING STRESS INDEX

Percentiles based on author's normative sample of
534 families from central Virginia

Total Stress Score	Percentile Rank	Child Domain Score	Percentile Rank	Parent Domain Score	Percentile Rank
131	1	50	1	69	1
138	2	54	2	72	2
144	3	58	3	76	3
151	4	62	4	79	4
157	5	66	5	82	5
160	6	67	6	84	6
162	7	69	7	85	7
165	8	70	8	87	8
167	9	72	9	88	9
170	10	73	10	90	10
172	11	74	11	92	11
174	12	75	12	94	12
175	13	76	13	95	13
177	14	77	14	97	14
179	15	78	15	99	15
181	16	79	16	100	16
183	17	80	17		
184	18			101	18
186	19	81	19		
188	20	82	20	102	20
189	21	83	21	103	21
191	22	84	22	104	24
192	23	85	23	105	23
194	24	86	24	106	24
195	25	87	25	107	25
196	26			108	26
197	27	88	27		
199	28			109	28
200	29				
201	30	89	30	110	30
202	31	90	31		
204	32			111	32
205	33	91	33		
207	34				
208	35	92	35	112	35
209	36	93	36	113	36
210	37				
212	38	94	38	114	38
213	39				
214	40	95	40	115	40
215	41			116	41
	42	96	42		
216	43			117	43
	44				
217	45	97	45	118	45
218	46			119	46
219	47	98	47		
	48			120	48
220	49				

PARENTING STRESS INDEX

Total Stress Score	Percentile Rank	Child Domain Score	Percentile Rank	Parent Domain Score	Percentile Rank
221	50	99	50	121	50
222	51				
	52			122	52
223	53				
	54				
224	55	100	55	123	55
225	56			124	56
226	57	101	57		
	58			125	58
227	59				
228	60	102	60	126	60
229	61	103	61	127	61
230	62				
231	63			128	63
232	64	104	64		
233	65	105	65	129	65
234	66			130	66
235	67	106	67		
237	68			131	68
238	69				
239	70	107	70	132	70
240	71	108	71	133	71
241	72			134	72
242	73			135	73
243	74	109	74	136	74
244	75	110	75	137	75
245	76	111	76	138	76
246	77	112	77	139	77
248	78				
249	79	113	79	140	79
250	80	114	80	141	80
252	81			142	81
253	82	115	82	144	82
255	83			145	83
256	84			147	84
258	85	116	85	148	85
260	86	117	86	149	86
262	87	118	87	150	87
263	88	120	88	151	88
265	89	121	89	152	89
267	90	122	90	153	90
272	91	124	91	156	91
277	92	125	92	159	92
283	93	127	93	162	93
288	94	128	94	165	94
293	95	130	95	168	95
298	96	134	96	173	96
304	97	138	97	178	97
309	98	141	98	183	98
320	99+	145	99+	188	99+

FRS

Percentiles for FRS based on EIRI sample of pretest data on 621 cases

Scale Total Score	Percentile Rank
68	1
69	2
70	2
71	2
72	2
73	2
74	2
75	2
76	3
77	3
78	3
79	4
80	4
81	4
82	5
83	5
84	5
85	5
86	6
87	6
88	7
89	7
90	9
91	10
92	11
93	12
94	12
95	13
96	14
97	16
98	16
99	17
100	19
101	21
102	23
103	25
104	25
105	28
106	29
107	30
108	32
109	33
110	35
111	37
112	39
113	40
114	41
115	43
116	46
117	48
118	50
119	51
120	54
121	55
122	57
123	60
124	61
125	63
126	65
127	66
128	68
129	69
130	70
131	73
132	75
133	77
134	78
135	79
136	82
137	83
138	85
139	87
140	88
141	89
142	91
143	93
144	93
145	94
146	95
147	96
148	97
149	97
150	100

Percentiles for FSS based on EIRI sample of 643 mothers only

Scale Total Score	Percentile Rank	Scale Total Score	Percentile Rank
5	1	50	96
6	1	51	96
7	2	52	96
8	2	53	97
9	2	54	97
10	3	55	98
11	4	56	98
12	5	57	98
13	7	58	98
14	9	59	99
15	10	60	99
16	13		
17	18		
18	21		
19	25		
20	27		
21	29		
22	33		
23	36		
24	39		
25	42		
26	45		
27	47		
28	50		
29	54		
30	57		
31	63		
32	66		
33	69		
34	71		
35	72		
36	75		
37	77		
38	79		
39	82		
40	84		
41	85		
42	88		
43	90		
44	92		
45	93		
46	94		
47	95		
48	95		
49	96		

FILE

Percentiles to be used when reporting scores

NORMS

National norms based on approximately 980 couples (1,960 individuals) included in this study of families is indicated in Table VIII. This sample includes couples across the family life cycle from young married couples to those retired.

Norms on File

Total Sample--Across Life Cycle

Raw Score	Total Percentile
1	96
2	92
3	88
4	81
5	75
6	69
7	62
8	55
9	47
10	40
11	34
12	29
13	24
14	20
15	15
16	12
17+	10

X	8.8
Mode	9.6
SD	5.87
Skewness	-1.326
Kurtosis	5.484
Range	57.

* Note that a low percentile score is related to high stress. Therefore, the higher the percentile score the better.

Appendix B

Early Intervention Program Inventory

EARLY INTERVENTION
PROGRAM INVENTORY

Contact: ______________________________	Title: ________________
Program Name: __________________________	Phone: ( ) ____________
Address: ______________________________	
______________________________	
______________________________	
Completed by: __________________________	Date: ________________

Efficient operation of an early intervention program requires an understanding of what the program is designed to do, how services are organized and delivered, what type of children and families are served, what it costs to operate the program, and what effects the program has on participating children and families. Such information can be valuable for self improvement, as well as providing useful information for other service providers (who might be looking for a particular type of program to adopt), planners and administrators (who might want to identify gaps in available services), and parents (who might want to know what options are available for their child).

The EARLY INTERVENTION PROGRAM INVENTORY contained in this booklet is designed to elicit information in the following four general areas.

Description of Program: What type of theoretical approach, instructional methods, assessment procedures, curriculum materials, etc., are used by the program?

Description of Children Served: What are the ages, functional abilities, demographic characteristics, etc., of children and families served by the program?

Program Costs: How much does the program cost to operate and how much would it cost to replicate elsewhere?

Program Benefits: What effect does the program have on participating children and families?

Each section of the booklet explains the procedures for gathering information in one of these areas. Please note that answers to all questions in this booklet must reflect the status of the program during the last fiscal year for which books have been closed. Before beginning, it is essential for you to decide:

> Is it most accurate to portray the early intervention services you provide as a single program (in which case you should complete only one set of forms);
>
> *or*
>
> Is it most accurate to portray the early intervention services you provide as two or more distinct programs (in which case you should complete a separate set of forms for each distinct program).

Deciding whether your services should be considered as a single program or multiple programs is somewhat subjective and can best be done by you as the program administrator.

The following are characteristics of a single program:
All clients in the program:
1. Receive the service(s) in a similar setting.
2. Have available to them the same (or comparable) set of services.
3. Receive the service(s) at a similar degree of intensity and duration.

The following are characteristics of multiple programs:
Some (more the 10) of the clients in the program:
1. Receive the service(s) in a setting different from other clients and/or
2. Have available to them either a greater number of services or a different set of services than other clients and/or
3. Receive the service(s) at a degree of intensity or duration (length of time each session, or frequency of sessions) which is significantly greater than that received by other clients.

The fact that early intervention services are individualized (e.g., therapy for some children focuses primarily on language, for others the primary focus is motor therapy, etc.), or that some families and children receive different services based on assessed need (e.g., only those families needing it receive home visits from a social worker) does not mean that you have multiple programs. Rather, these are variations of a single program. On the other hand, multiple programs exist when the types of services available to one group of clients vary from what is available to another group of clients.

Once you have decided whether the early intervention services you provide should be considered as a single program, or multiple programs, complete items 1-6 below.

1. On the lines below, enter names or brief descriptors of the program or programs for which you will complete forms.

   Program #1: ______________________________

   ____

   Program #2: ______________________________

   ____

   Program #3: ______________________________

   ____

2. Was there anything exceptional about the program's income or expenditures in this fiscal year?
   No: _________ Yes (explain):

BEFORE PROCEEDING:

- Make additional photocopies of this packet as necessary so that you have one complete set for each of the programs listed above.
- Note that on the top of each page of the form you will find a place to insert the name of the program you are describing. This will help you remember which program you are describing as you complete the form. (This is especially important if you have multiple programs.)
- Now proceed in completing the booklet form for each program listed under item 1.

PART A: DESCRIPTION OF PROGRAM

By answering the following questions, you will provide a summary description of the major elements of your program. Questions have been organized to address the major dimensions on which early intervention programs can differ. While it is understood that there are many important aspects to a program that are not addressed by these questions, those elements which are generally thought to be essential to defining different program models or approaches have been included. *

Name of Program ______________________________

SETTING OF PROGRAM

- Listed below are the different settings in which early intervention services are generally provided. Decide which service setting best describes this particular program and indicate the number of handicapped and nonhandicapped children typically enrolled in your program at any one time. (Remember, you are only completing this form for one program, therefore you will only indicate the number of children in one of the settings below.)

	# of Handicapped Children Served, On the Average	# of Nonhandicapped Children Served, On the Average
Home Based: Almost all or all services are carried out in the family's own home, even though the family may visit the center occasionally for meetings, demonstrations, etc.		
Center Based: Almost all or all services are carried out in a center (e.g., school, church, community center) even though program staff may make occasional home visits.		
Combination (home and center): A minimum of 25% of the total service is provided in each the home and the center. Home servicses may be provided by family members or staff.		
Residential: Except for holidays, weekends, and/or vacations, the child lives away from his/her family in a residential center where almost all or all services are provided.		

- Area served: Urban: ________ Rural: ________ Both: ________

Name of Program ______________________________

INSTRUCTIONAL GROUPINGS

- **Answer the following questions if you are describing a center-based or combination center and home-based program. If your program is home based, go to the next page.**

- Early intervention services are provided in large groups (defined here as most of the seven or more children in the classroom participating at the same time in a group activity), small groups (defined here as a subgroup of children), or one-on-one (defined here as one child and one "instructor" doing an activity). Considering the total time a "typical" child spends in your program, what is your best estimate of the percentage of time spent in each of these settings. Indicate your estimate for each type of instructional grouping (a-c) in the space provided. The sum of a+b+c should be 100%.

  a. % of child's time in large groups ________
  b. % of child's time in small groups ________
  c. % of child's time one-on-one ________
  TOTAL ____100%
  (note: the sum of the entries for a, b, & c must be 100%)

- How many classrooms are a part of the program? _____

- Average teaching staff/child ratio:
  0-2 year-olds: __________:__________
  3 year-olds: __________:__________
  4 year-olds: __________:__________
  5 year-olds: __________:__________

- How many of these classrooms, if any, integrate nonhandicappd children? _____
  **if this program does not integrate nonhandicapped children, skip to the next page.*

- What is the average ratio of handicapped children to nonhandicapped children in the integrated classes?

  __________:__________
  handiapped nonhandicapped

Name of Program ______________________________

DURATION/INTENSITY OF SERVICES

Although there may be some variation in the amount and frequency of services provided to children in your program, base your answers to the following questions on the "typical" or "average" handicapped child.

- Length of service:

  Hours per day__________
  Days per week__________
  Weeks per year__________

- How long is the average child enrolled in your program?

____	less than 1 month	____	13-24 months
____	1-3 months	____	25-36 months
____	4-12 months	____	37 months or more

- Select the one answer which best approximates the average attendance (i.e., percentage of scheduled visits that are accomplished) in your program. A general approximation rather than a precise answer is what is needed.

____	90% to 100%	____	50% to 74%
____	75% to 89%	____	less than 50%

CURRICULUM MATERIALS

- What percentage of your instruction includes the use of a commercially-available curriculum (e.g., LAP, DISTAR, Portage, etc.)?

  ____ %

If your program makes substantial use of published curricula, list the three most commonly used curricula.

____

____

____

____

Name of Program ____________________

PERSONNEL DESCRIPTION

For each staff member, please provide the following information

A Position	B FTE	C Years of Experience	D Degree	E Certifications

Name of Program ____________________

TYPE OF SERVICES

- Listed below are a variety of services that might be provided as a part of an early intervention program. For each type of service make an "X" to indicate the degree to which families/children in your program receive that service directly through your program. *Note that "available on a limited basis" means that fewer services are available than would be desirable.

	Not Available Through The Program	Available Through Program Referral	Available On A Limited Basis *	Available To All Who Need The Services
a. Educational/Developmental skill development				
b. Speech therapy				
c. Physical and/or occupational therapy				
d. Adaptive physical education				
e. Routine medical/health care (e.g., immunizationa, "well" baby check-ups)				
f. Major medical (e.g., surgery, medical care for chronic illness)				
g. Music therapy				
h. Nutritional supplements or counseling				
i. Swimming				
j. Psychological services for the child				
k. Psychological services for family members				

Name of Program ______________________________

FAMILY INVOLVEMENT

- Listed below are the major alternative ways in which different early intervention programs could involve parents and family members. For each option (a through h) make an "X" to indicate aproximately what percentage of parents in your program usually become involved in each option you have available.

	Not Available In Program	Only By Referral To Other Programs	Used By 1-25% Of Parents	Used By 26-50% Of Parents	Used By 51-75% Of Parents	Used By More Than 75% Of Parents
a. **Parent Training.** Training family members to teach the child developmental skills such as feeding, language, or motor skills. Teaching may be integrated in daily activities or at separate times in the home.						
b. **Classroom Aide.** Regular participation by family member(s) (at least once a month) as aides in the classroom to assist with programming.						
c. **Group Meetings.** Parents, siblings, or father group meetings conducted by staff at least twice a year designed to provide mutual support, information, parenting skills, or a network of people in similar situations.						
d. **Resource Access.** A structured program to assist family to obtain housing, medical care, food, counseling, or other community based services that are not provided directly by the early intervention program.						
e. **Respite Care.** Weekend, evening, or vacation child care provided in addition to the regular program.						
f. **Parent-to-Parent Network.** An organized program which uses "experienced" parents to contact and provide individual support and assistance to "new" parents.						
g. **Program Governance.** Opportunities for parents to take an active role in deciding the content, organization, and staffing of the program.						
h. **Educational Planning.** Involvement of parents in developing their child's educational program.						

Name of Program ______________________________

PHILOSOPHICAL ORIENTATION

- **All early intervention programs are organized according to explicit or implicit assumptions about how children develop and learn, and how instruction/therapy can be organized and delivered most effectively. Statements representative of different philosophical orientations are listed below. Please select one of the following descriptions which most accurately describes your program (note: even if none of the descriptions are totally correct, select the one which is closest).**

__ a. Children learn best when systematic positive reinforcement follows the desired behaviors and they are praised and rewarded for their efforts. Extrinsic rewards may be necessary to support children's early learning until they reach a level of mastery that allows them to enjoy new skills for their own intrinsic reward. Criticism, verbal or physical punishment, and coercion do not encourage learning or teach desired behavior and consequently are inappropriate. Desired behavior in the child should be systematically reinforced by praise and pleasurable consequences. Antisocial or unproductive behaviors should be ignored. Teaching is done via structured, carefully sequenced lessons based on behavior and reinforcement principles and task analyses of concepts/skills that elicit frequent responses from the child.

__ b. Emphasis should be to develop children's thinking skills, as well as teach academic subject area competencies. Active experience with real objects, experimentation, exploring, and talking about experiences are more effective in teaching children than telling and showing them what to do. Classroom environment should provide an open framework that encourages each child to pursue his/her own interests and ideas through key experiences that develop his/her ability to (a) make decisions about what he/she is going to do and how to go about doing it, (b) express self in ways that communicate that experiences to others, (c) work with other children and adults so that tasks are completed through group planning and cooperative effort, (d) exercise self-discipline by identifying personal goals, by pursuing and then completing selected tasks, and (e) embrace a spirit of inquiry and openness to various points of view. The teacher's role is defined as one of facilitator and catalyst for children's learning. The teacher must create an environment wherein children will engage in active learning and where a variety of materials, resources, and objects are available.

__ c. Education should be based upon a developmental approach in that the classroom is the child's workroom, where he/she should be free to explore, discover, make choices, and seek out his/her own means for learning. A productive learning environment is one that is constantly rearranged to fit the child's changing interests and needs. The teacher's role is one of building trust, being responsive to children's needs and feelings, and sensitizing them to sights, sounds, feelings, and ideas to help build positive images of themselves as learners. Top priority is placed on children's emotional growth and stability, feelings of self worth, self expression, and self image. Activities are child-initiated and child-directed, with teachers acting in roles as interpreters of experience. Teaching is carried out on basis of child's response by elaborating upon and interpreting the experience and feelings.

PART B: DESCRIPTION OF CHILDREN

Name of Program ______________________________

As was indicated in the introductory instructions, a separate Description of Children form should be completed for the children in each of your programs. You should have made one copy of Part B for each program you listed on page 2. If you haven't done this, do it now.

Complete the items below:

- Estimate the approximate number (#) of children (both handicapped and nonhandicapped) in your program who are from each of the following race or ethnic origins:

_____ # White (non-hispanic)
_____ # Black (non-hispanic)
_____ # Hispanic
_____ # Other (please specify) ____________________
_____ # Pacific Islander
_____ # Asian
_____ # Native American

- Estimate the approximate number (#) of children (both handicapped and nonhandicapped) in your program who live in each of the following situations:

_____ # Both parents in the home
_____ # One parent at home
_____ # Living with relatives other than parents
_____ # Other (please specify) ____________________

- Estimate the appropriate number (#) of children (both handicapped and nonhandicapped) whose parents (the primary provider) work in the following types of positions.

_____ # White collar
_____ # Blue collar
_____ # Unskilled
_____ # Student
_____ # Unemployed

- Estimate the number (#) of children in each age category below.

	# of children under 3 yrs old	# of children 3 yrs old	# of children 4 yrs old	# of children 5 yrs old
Handicapped				
Nonhandicapped				

Name of Program ________________________________

- **Indicate how many children in this program have the following disabilities as their primary handicapping condition.**

Type of Disability	# of Children
Autistism	________
Hearing Impaired	________
Visually Impaired	________
Speech/Language Impaired	________
Learning Disabled	________
Orthopedically Impaired	________
Behaviorally Disordered	________
Emotionally Disturbed	________
General Developmental Delay	________
Multiply Handicapped	________
Mentally Retarded	________
Other Health Impaired	________
Nonhandicapped	________

________ TOTAL
(note that this total should be consistant with total reported on page 4 of handicapped and nonhandicapped children)

- **Indicate the severity of the handicapping conditions of the handicapped children in your program by entering the approximate number of handicapped children at each level.**

_____ mild
_____ moderate
_____ severe
_____ profound
_____ TOTAL (this total should be consistent with total number of handicapped children reported on page 4)

Child Description of Visual and Hearing Abilities Recording Form

Complete the Child Description of Visual and Hearing Abilities Recording form by evaluating each child using the criteria below. NOTE: This evaluation may be completed at the same time as the Battelle Developmental Inventory evaluation for Part C is completed.

Sight

1 = Normal
2 = Suspected visual impairment
3 = Documented mild visual impairment
4 = Documented moderate visual impairment
5 = Documented severe visual impairment
6 = Documented profound visual impairment

Hearing

1 = Normal
2 = Suspected hearing impairment
3 = Documented mild hearing impairment
4 = Documented moderate hearing impairment
5 = Documented severe hearing impairment
6 = Documented profound hearing impairment

Student Name or ID #	Sight	Hearing

PART C: DESCRIPTION OF EFFECTS

Name of Program ____________________________________

In order to complete Part C, the Battelle Developmental Inventory (BDI) should have been completed for each **handicapped** child in your program at the beginning and end of the year or upon entrance to and exit from your program.

When completing the Score Summary on the last page of the BDI Scoring Booklet, be sure to enter percentiles as the standard score by referring to pages 74 to 111 in the BDI examiner's manual. Percentiles can be easily interpretted. For example, if the children in your program scored at a mean of the 45th percentile, then you might be able to conclude that, on the average, your children performed as well or better than 45% of the children who were in the norming population for the Battelle.

Complete the Child Performance Recording Form by entering the appropriate information from the Score Summary for each **handicapped** child in this program. Be sure that only children in the particular program you are describing are included here (i.e., the total number of **handicapped** children should be the same as that reported on page 4 of this inventory).

Follow these steps in completing the Description of Child Performance Recording Form:

1. Enter the appropriate name of the program in the blank at the top of the form.
2. Enter each student's (or ID #) in the appropriate column.
3. Enter each Pretest (the first test) percentile for each of the domains and the BDI total in the appropriate columns. Make sure that the scores entered under "Pretest NCE" are in fact from the first administration of the Battelle for each child.
4. Enter each Posttest (the second administration of the test) percentile for each of the domains and the BDI total in the appropriate columns.
5. For each child compute gain scores by subtracting the Pretest percentile from the Posttest percentile in each domain and the BDI total column, and enter these figures in the appropriate columns.
6. Compute a total gain score for each domain and the BDI total, across all of the students, by adding up each gain score column and entering the total in the appropriate spaces across the line labeled "Total Gains." If you are using multiple copies of this recording form in order to report data on all children in your program, be sure to compute the total gain scores including all children, on all pages, and enter your total only on the last page.
7. Compute an average gain score for each domain and BDI total by dividing the total gain scores in each domain and BDI total by the total number of students on which you are reporting pretest and posttest data. Enter this score in the appropriate spaces on the line labeled "Average Gain." This figure is your program's average, or mean, achievement gain in each domain and on the BDI total.

Name of Program ________________________________

CHILD PERFORMANCE RECORDING FORM

STUDENT	PERSONAL/SOCIAL			ADAPTIVE			MOTOR			COMMUNICATION			COGNITIVE			BDI TOTAL		
	Pre %tile	Post %tile	Gain Scores (post %tile - pre %tile)	Pre %tile	Post %tile	Gain Scores (post %tile - pre %tile)	Pre %tile	Post %tile	Gain Scores (post %tile - pre %tile)	Pre %tile	Post %tile	Gain Scores (post %tile - pre %tile)	Pre %tile	Post %tile	Gain Scores (post %tile - pre %tile)	Pre %tile	Post %tile	Gain Scores (post %tile - pre %tile)
TOTAL GAINS																		
AVERAGE GAINS: Total Gains ÷ # of Students																		

PART D: DESCRIPTION OF PROGRAM COSTS

The purpose of the attaced form is to estimate the cost per child of your program for preschool-aged handicapped children. Please complete it based on actual expenditure and attendance data for the 1987-88 Year Program. If you have not completed the program year, please project costs to the end of the year. For each "Type of Cost" on the form, enter the total expenditure first and then divide by the appropriate number of children to calculate the figure to be entered for per child cost. You may or may not have entries for each type of cost. If the cost of a staff person or an item is entered on one line, do not re-enter that cost on a later line. There should be no double-counting. Suggestions for determining costs by Type of Cost are provided below.

Instructional Costs. The costs of direct service personnel includes salaries and benefits (including the employer's share of social security). If personnel are shared with another program, costs should be prorated based on the fraction of time devoted to this program. To calculate per child cost, divide by the number of children enrolled in the program.

Supplies, materials, and equipment. Include all expenditures for items used in the preschool program. Items that are shared with other programs should be prorated based on the fraction of children using the items who are in the preschool program.

Administration. Include personnel and nonpersonnel costs of the preschool program and all other programs that have administrative responsibilities for the preschool program up to and including the general school district administration. In most cases, it will be sufficient to report per child cost of higher administration units based on the total number of students, including those in the preschool program. Thus, if the program is administered by a school's special education office, and there are 500 special education students (including preschoolers), then divide total cost of the special education office by 500.

Transportation. If possible, report the actual cost for perschoolers and not simply a prorated fraction of a school's total transportation budget. Include all expenditures: personnel, vehicles, repair, fuel, insurance, etc.

Food Services. Account for the costs of all meals and snacks.

Facilities. Report actual expenditures for each category, prorated based on the number of children. If this information is available only at the district level, then use the district totals divided by the total number of children in the district to estimate cost per child for the preschool program.

Miscellaneous. Any expenditures not reported elsewhere should be reported here.

Donations and volunteers. If there are significant personnel or other resources that are donated (including facilities) indicate those here and estimate the value of the donation.

EARLY INTERVENTION PROGRAM COST FORM

TYPE OF COST	TOTAL	PER CHILD
Instruction:		
Teachers		
Aides		
Related services staff		
Related services purchased		
Screening		
Assessment		
Technical assistance to staff		
Staff inservice training		
Supplies, materials, and equipment:		
Instructional supplies and materials		
Related services staff and nonclassroom teacher supplies and materials		
Instructional equipment		
Related services staff and nonclassroom teacher equipment		
Administration:		
Preschool program administrators and secretaries		
Preschool program nonpersonnel administrative costs		
Special education administrators and secretaries		
Special education nonpersonnel administrative costs		
School administration		
General district administration		
Transportation:		
Student transportation		
Staff transportation		
Facilities:		
Facility operations and maintenance		
Facility modification and improvement		
Rent, mortgage payment, or debt service		
Miscellaneous:		
Donations:		
Volunteers:		
Total cost per preschool special education child:		

COST COLLECTION FORMS

Introduction

The following set of forms are part of the cost data collection system for cost-effectiveness analysis of early intervention programs. Two categories of cost data will be collected: personnel costs (e.g., teachers, consultants, administrators, etc.), and nonpersonnel costs (e.g., equipment, facilities, transportation, etc.). Included within these two categories are any volunteer time to your program as well as material donations.

It is suggested that you calculate and report costs on a separate set of forms for each program with which you work. This will allow comparison of costs and effects across programs. The directions for each form provide a guide to computing cost figures. In filling out the forms, read through all the instructions and forms before beginning. This will allow you to anticipate what information will be needed and determine which information is appropriate for each form.

Sometimes it may be necessary to estimate or give an average cost. In some cases, this is not end-of-year data collection, and you will not have all the required cost data yet. For example, the annual cost of utilities may have to be estimated from a previous year's data or projected from partial data for the current year.

Instructions for computing total program costs, after you have determined the cost of each program component, follow this set of cost forms.

PERSONNEL RESOURCES

Directions for computing total costs of staff salary

Fill in information for each staff member according to the following directions for each column on the Table on the following page.

A. Position

Give a descriptive title for each staff person either, full- or part-time, even if they are paid for by another program. Do not include those staff who work entirely for another program, even if they are paid for by this program. Typically, staff will include people such as:

supervisor
director
administrator
head teacher
speech therapist
aide
home visitor
board member
bookkeeper
psychologist
secretary
clerk
occupational therapist
physical therapist
food service worker
nurse
bus driver
custodian
teacher
physician
nutritionist/dietician
psychiatrist
behavior therapist
adaptive P.E. teacher

B. FTE (Full-Time Equivalent)

Indicate the portion of Full-Time Equivalent (FTE) that each person works on this program. If time is divided between two or more programs, list the FTE allotted to only this program. A full-time person would be "1.0," a half-time person , ".5," and a person working 10 hours a week (10/40), ".25."

C. Salary or Wages: Rate

List the wages earned for the largest contractual period (e.g., hour, week, month, or year). For example, if a teacher is hired for a 10-month period, salary might be listed as **"$15,000/10 mo."** An aide paid by the hour might be listed as **"$6/1 hr."**

D. Period of Employment

List the expected length of service to your program, by month and day, for the current funding year (e.g., 1987-88). For hourly workers who are hired for the school year, time period should be from the beginning to the end of the program (e.g., 9-13-87 to 6-6-88).

E. Total Salary

List the total salary for work performed for this program over the time period indicated. This should be calculated based on FTE (column B), salary or wage rate (column C), and period of employment (column D).

F. Benefits

List the actual amount of fringe benefits for the period of employment. Include FICA, health, life, dental insurance, and retirement. List any other benefits in the "other" column. Remember that part-time employees often receive reduced or no benefits. If the staff person works part-time for this program and part-time for another program, pro-rate benefits based on FTE. If total benefits are known (e.g., 19% of salary and wages), there is no need to enter each benefit separately, enter the total in column G and leave column F blank.

G. Total Benefits

Enter directly or add the columns under F to compute total benefits for column G.

H. Total

Add columns E and G to compute total compensation (column H).

STAFF SALARY

A	B	C		D		E	F				G	H
Position	FTE	Salary	Per	Period of Employment		Total Salary	Benefits				Total Benefits	Total
				From	To		FICA	Insurance	Retirement	Other		

CONSULTANTS

On the table below indicate persons who are not on the regular staff but who received compensation for services rendered (e.g., therapists, psychologists, staff trainers, etc.).

A. Type of Service
Indicate the type of service the consultant or organization performed for the program (e.g., assessment, therapy, inservice training).

B. Dates of Service
Give the month, day, and year of service or indicate when service started and ended. If service has not been completed, estimate that date of completion.

C. Number of Service Days or Hours
Indicate actual or estimated number of days or hours for which the consultant will be paid. If service included training with staff, indicate how may staff received training.

D. Compensation Rate
List the hourly or daily rate paid to the consultant for services. (May not apply to organizational contracts.)

E. Total Compensation
List the total amount of money paid to the consultant for services based on columns C and D. In some cases, it may be easier to list costs by type of service (A), giving total days or hours (C), compensation rate (D), and total compensation (E) for each type of service. You may do that if you wish.

A Type of Service	B Dates of Service	C Total Days or Service Hours	D Compensation Rate	E Total Compensation

VOLUNTEER STAFF

A. **Type of Service**
Indicate what type of service each volunteer (if any) performed for the program (e.g., training activities at home or center, clerical work, transportation for field trips, etc.). Include parent volunteers. NOTE: If parents provide transportation, mileage costs should be estimated under "Transportation" and time spent driving should be described here.

B. **Dates of Service**
Give the month, day, and year of service or indicate when service started and ended. If service has not been completed, estimate the date of completion.

C. **Expected Service Hours**
Indicate actual or estimated number of total hours volunteers provided each type of service.

D. **Estimated Compensation**
Multiply expected service hours by estimated wage rates: Use minimum wage ($4.35/hour) and average wage plus benefits ($10.50/hour)

A Type of Service	B Dates of Service	C Total Days or Service Hours	D Estimated Compensation

NONPERSONNEL RESOURCES

FACILITIES AND CAPITAL IMPROVEMENTS

Directions: Briefly describe the space used by your program. Indicate its purchase price or annual lease/ rental cost. Also describe and indicate the cost of any renovations or other capital improvements to your facilities.

	Description of buildings and land used by the program (include age of building)	Square footage used by the program	Purchase Price	or	Annual Lease/ Rental Cost
Example:	Center, 30 years old	4,700	$ 92,770		

VEHICLES

Directions: Describe (make, model, mileage, year) any vehicles owned or rented by the program. Indicate the purchase price or annual lease/rental cost.

	Vehicle Description make/model/mileage/year	Purchase Price	or	Annual Lease/Rental Cost
Example:	Dodge / Omni / 104,583 / 1983	$ 6,986		
Example:	Chev. / Citation / 15,463 / 1986			$ 3,060 / year

EQUIPMENT

Directions: On the table below, describe the equipment used by your program which has a value greater than $500. For each item, indicate its purchase price or annual lease/rental cost. At the bottom of the page, provide an estimate of the value of the equipment worth less than $500. Sum the cost of all equipment.

	Description	Purchase Price or	Annual Lease/Rental Cost
Example:	desk	$ 685	
Example:	piano		$ 120 / year

Total cost of all equipment with a value less than $500: ____________

Total cost of equipment with value greater than $500: ____________

Total cost of all equipment: ____________

TRANSPORTATION

A. Child Transportation:

1. Program Provided: Transportation cost per mile should include the cost of drivers, fuel, maintenance, insurance, child restraints, etc. If it does not, include under "other."

Number of children ________________

Cost per mile ____________________

Miles per year ___________________

Other (specify) __________________

TOTAL ANNUAL COST $ ____________

2. If you contract services from a bus company indicate:

Name of company _________________

Number of children ________________

Contract price ____________________

TOTAL ANNUAL COST $ ____________

3. Parent Provided:

Average round trip mileage __________

Number of round trips per day _______

Number of children ________________

Cost/mile ________________________

TOTAL ANNUAL COST $ ____________

B. Staff Transportation: includes job-related travel, such as home visits, travel between centers, any air travel, and consultant travel paid for by the program.

For each staff member for which transportation is paid provide the following information:

Personnel	Average Miles / Month	Number of Months	Cost / Mile	Total

Materials and Supplies — Annual Cost

Indicate the program's total annual expenditure on materials and supplies (paper, pens, pencils, typewriter ribbon, custodial supplies, etc.). $ ________

Utilities

Indicate the total cost for all utilities. If some, or all, utility costs are included in direct or occupancy charges, indicate that and do not re-enter the costs here. $ ________

Insurance

Indicate total annual expenditures on all insurance costs associated with program operation. Includes vehicle, building, etc. (Again, if included elsewhere, indicate and do not double count here.) $ ________

Food

Indicate total annual expenditures on food. $ ________

Meals served (check all that apply):

breakfast ______
a.m.snack ______
lunch ______
p.m. snack ______
dinner ______

Miscellaneous

Indicate any costs associated with the program which are not included elsewhere (e.g., debt service, magazine subscriptions, field trip expenses, etc.). $ ________

Private Contributions

Describe here any in-kind contributions to your program for this fiscal year and indicate the estimated value.

$__________________

CALCULATION OF TOTAL PROGRAM COST

Once you have determined the resources used by your program and have completed the set of cost forms, it is necessary to compute the total cost of the program.

The computation of the total cost of staff salaries, contracted personnel/consultants, and volunteers is straightforward, if the figures on the cost forms accurately represent the quantity of resources consumed by your program (i.e., salaries and benefits have been prorated according to FTE's). Simply sum the "total" columns and record figures on the cost summary worksheet in the appropriate categories.

Facilities, vehicles, and equipment are fixed assets with an extended useful life; replaceable items consumed within a year's time are not included in this category. For items that are owned rather than rented, depreciation and implicit interest needs to be applied to allocate costs to the relevant time period (e.g., 1987-88 school year). This can be done in a variety of ways according to accepted accounting principles. We provide proceudres that can be followed in the event that you are unfamiliar with another method. This simple method, discussed in Levin (1983), allows one to avoid tedious calculations of depreciation and implicit interest values by simply applying an annualization factor. First, for each fixed asset item (whether facilities, vehicles, or equipment), multiply the replacement cost by the appropriate annualization factor from Table 1 based on the age of the asset and interest rate. For anything rented, all you need to do is list the annual rent: rented and leased capital costs do not need to be annualized.

Most of the remaining items are self-explanatory--sum total columns to arrive at total cost for that item and enter the figure on the cost summary worksheet. Divide the totals by number of children served (or estimated capacity if program is not yet fully operational) to yield cost per child. Divide cost per child by service hours (per year or program duration) to arrive at the cost per hour for your program.

COST SUMMARY WORKSHEET

Resources	Cost
Salaried Staff	$
Contracted personnel/consultants	
Volunteers*	
Facilities	
Buildings	
Land	
Capital improvements	
Vehicles	
Transportation	
Staff	
Children	
Equipment	
Materials/supplies	
Utilities	
Insurance	
Food	
Miscellaneous	
Contributions	
TOTAL PROGRAM COST	$
Cost per child	$
Cost per hour	$

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*1986 minumum wage rate in the U.S. is $3.35/hour.
1986 average wage rate in the U.S. is $8.74/hour.
Source: U.S. Bureau of Labor Statistics, 1986.

Table 1

Annualization Factors for Determining Annual Cost of Facilities and Equipment for Different Periods of Depreciation*

Lifetime of Assets (n)	10%
1	
2	0.5762
3	0.4021
4	0.3155
5	0.2638
6	0.2296
7	0.2054
8	0.1874
9	0.1736
10	0.1627
11	0.1540
12	0.1468
13	0.1408
14	0.1357
15	0.1315
16	0.1278
17	0.1247
18	0.1219
19	0.1195
20	0.1175
21	0.1156
22	0.1140
23	0.1126
24	0.1113
25	0.1102
26	0.1092
27	0.1083
28	0.1075
29	0.1067
30	0.1061

*Annualization Formula: $a(r_1 n) = \dfrac{[r(1+r)^n]}{[(1+r)^n - 1]}$

Where r = interest rate and n = lifetime of asset for depreciation.

Source: Levin, H. (1983). Cost-effectiveness: A primer (Vol.4). Beverly Hills, CA: Sage.

Child's Birthday __ __/__ __/__ __ (18-23)
M M D D Y Y

Date Completed __ __/__ __/__ __ (24-29)
M M D D Y Y

Child's major handicapping condition(s)
&/or risk factors
____________________________ (30-37)

Source for the above classification (e.g., staff judgement, medical records, educational/psychological evaluation, etc.)
____________________________ (38-41)

THE ABILITIES MODEL

(Simeonsson & Bailey, 1984)

INSTRUCTIONS: The table provides a means to define the child's status in 9 major areas. For each column, place an "X" in the space that best describes the child.
PLEASE NOTE: You need to make four (4) X's under limbs and two (2) each under Extremity-Leg and Sight.

For FPG Use Only

Card number __ __ (1-2)

For Program Use - Please complete

Project ID __ __ (3-4)
Child ID __ __ __ __ __ (5-9)
Interviewer ID __ __ (10-11)
Collection Period __ (12)
Individual Period __ (13)

Level	A	B	I	L				I	T		I	E		S	
	Audition	Behavior	Intelligence	Limbs				Intentional Communication	Tonicity		Integrity of Physical Status	Extremity - Leg		Sight	
				Left		Right			Hyper-	Hypo-		Rt	Lt	Rt	Lt
				Arm	Hand	Arm	Hand								
1	Normal	Normal	Normal within expected rate of development for age	Complete normal use				Intentional communication adequate for age even if communication is non-verbal (e.g., signing, bliss symbols, etc.)	Normal	Normal	Overall good health	Complete normal use		Normal	
2	Suspected hearing impairment	Occasional expressions of unusual behavior	Slow (Borderline) 3/4 rate of expected development for age	Some involvement but functional				Intentional communication less than adequate for age but generally functional even if it is non-verbal	Variable but mostly normal		Variable, more than normal health problems	Some involvement but functional		Suspected visual impairment	
3	Documented mild hearing impairment	Occasional expressions of asocial/atypical behavior	Mild delay 2/3 rate of expected development for age	Usable with minimal support				Limited use of idiosyncratic gestures/vocalizations	Mild Degree	Mild Degree	Chronic but minor health problems	Usable with minimal support		Documented mild visual impairment	
4	Documented moderate hearing impairment	Frequent expressions of asocial/atypical behavior	Moderate delay 1/2 rate of expected development for age	Usable with some support				Ability to communicate very limited and/or setting specific	Mod. Degree	Mod. Degree	Chronic, controlled health problems	Usable with some support		Documented moderate impairment	
5	Documented severe hearing impairment	Frequent expressions of bizarre/atypical behavior	Severe delay 1/3 rate of expected development for age	Usable only with external support				Only occasional evidence of some form of communication: primitive and basic in nature	Severe Degree	Severe Degree	Chronic, uncontrolled health problems	Usable only with external support		Documented severe impairment	
6	Documented profound hearing impairment; Deaf	Constant expressions of bizarre, atypical, out of control behavior	Profound delay 1/4 rate of expected development for age	Useless				No evidence of any form of intentional communication	Totally Rigid	Totally Rigid	Total incapacitation due to chronic health problems	Useless		Documented profound visual impairment; Blind	
	__ (42)	__	__	__	__	__	__	__ (49)	__	__	__	__	__	__	__ (56)

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Appendix C

Advisory Committee Agenda/Minutes

AGENDA

Advisory Committee for the Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children

Sunday, November 22

8:00 p.m.	Optional dinner for those who arrive early (Details left at hotel registration desk)	

Monday, November 23

11:30 a.m.	Optional lunch for those who arrive early (Details left at hotel registration desk)	
1:00 - 3:00	Large Group Discussion --Welcome and introductory remarks --Overview of two studies:	 Salt Lake City IVH Sunshine/Richardson
3:00 - 3:15	Break	
3:15 - 4:30	Small Group Discussions	
	Conceptual/Theoretical Framework	Ramey, Darlington, Warren, Bricker
	Dissemination	Slaughter, Crocker
	Onsite Evaluations/Treatment Verification	Haltom, Warren, Fredericks
4:30 - 5:00	Executive Session of Advisory Committee --Review first day's discussions --Review agenda for following day	
7:00 - 9:00	Dinner with invited guests - Marriott Crystal City	

Tuesday, November 24

Morning

8:00 - 8:30	Continental Breakfast	
8:30 -10:00	Large Group Discussion on Assessment of Parental Involvement	
10:00 -10:15	Break	

10:15 -12:00	Small Group Discussions	
	Videotape Assessments	Warren, Slaughter, Bricker
	Data Analysis	Darlington, Haltom, Fredericks, Ramey
	Health Forms/Birth Certificates	Crocker

Afternoon

12:00 - 1:30	Lunch -- Advisory Committee meets in executive session to formulate recommendations (Marriott Crystal City)
1:30 - 3:00	Discussion of Advisory Committee recommendations
3:00	Adjourn

Optional Topics

Longitudinal Tracking
Parent Coping
Treatment Verification (Note: This has been included in the current agenda with Onsite Evaluations, but it could be a separate topic.)

Minutes of the National Advisory Committee for the Longitudinal Studies of Costs and Effects of Early Intervention with Handicapped Children

Washington, DC

November 23-24, 1987

Attendance:

Advisory Committee Members: Diane Bricker, Allen Crocker, Richard Darlington, Bud Fredericks, Craig Ramey, Diana Slaughter, and Steve Warren

EIRI Staff: Karl White, Glen Casto, Steve Barnett, Chuck Lowitzer, Teri Wingate-Corey, and Ellen Frede

Invited Guests: Jim Hamilton (OSERS), Tom Behrens (OSERS), Naomi Karp (NIDRR), Phyllis Berman (NICHD)

The agenda for the meeting is included in Attachment 1. As shown in the agenda, some issues were discussed with the entire Advisory Committee, and others were done with subcommittees of people who had particular interests or expertise in a given area. The following summary of each issue specifies whether it was a large or small group discussion. These minutes summarize the general discussion of each topic that was covered from the agenda and are followed by the specific recommendations given by the Advisory Committee at the conclusion of the meeting.

Discussion of Arkansas Research Study (Large Group)

As an example of the type of data being collected by each site, Chuck Lowitzer presented pre- and postdata from the Sunshine/Richardson site for the subsample of children for whom complete data were available. Demographic and pretest data for the available sample that can be used to judge the comparability of the experimental groups were discussed extensively. At this point, there were no statistically significant differences between the groups on the results of this Battelle

Developmental Inventory (BDI) or the Parenting Stress Index. There were, however, statistically significant differences on the Family Adaptability and Cohesion Evaluation Scales (FACES III). It was noted by several committee members that it would be premature to draw any conclusions from these findings, since the data are still incomplete with regard to sample size and additional outcome measures. The data and analyses from this one site did provide a concrete example of more general issues that concerned all sites. Two particular questions were discussed extensively:

1. How and when should site staff be given results?
2. How should scores for severely impaired children be treated in the analyses?

How and When Should Site Staff be Given Results?

Committee members expressed concern that if results were given to cooperating staff before the study was complete, then practices at the site might change. Even if feedback was limited to the pretest Battelle score, there might be a danger of teaching to the test. However, some members felt that knowledge of pretest scores could be considered as part of the treatment and, therefore, not be a concern. The type of pretest data on the BDI, which is routinely available to sites, was shown to the Advisory Committee, and it was decided that the provision of this type of information would not be a problem. With regard to outcome data, it was suggested that a priori-identified criteria for determining when to inform sites should be developed, and until those criteria are met, feedback should be restricted to information about treatment implementation.

How Should Scores for Severely Impaired Children be Treated in the Analysis?

A recurring issue in this meeting, which was first broached during this discussion, was the definition being used for severely or multiply handicapped children. Because children suffering from severe impairments are so different from most children included in the research, the committee felt that BDI scores should not be the primary outcome measure for severely impaired children. As a part of this discussion, it was recommended that systematic information be collected from direct service providers in each site about the areas in which they expect children and families to change as a result of their intervention program. Additionally, it became clear that the criteria for what constitutes a severely or multiply handicapped child were not well defined for these studies. The Advisory Committee recommended additional thought be given to this area.

Small Group Discussions

Prior to the meeting, Advisory Committee members had indicated what topics they were most interested in discussing and where they thought their input would be most useful. Based on this input, small group discussions focused on the conceptual/theoretical framework on which this research is based, dissemination activities of the Institute, and the use of on-site evaluations as a part of the treatment verification procedures. Those discussions are summarized below.

Conceptual/Theoretical Framework

Craig Ramey, Diane Bricker, Glendon Casto, and Steve Barnett participated in this small group discussion. The conceptual framework was presented at a global abstract level by staff members. After some discussion by committee members, it was determined that committee members wanted a discussion of the conceptual framework at a more concrete level. That is, they wanted to know which research questions were derived from systems theory and how systems theory drove the selection of specific outcome measures. Dr. Casto gave some examples suggesting that the issues of when intervention should start and how intense interventions should be were research questions suggested by systems theory. Further, the choice of outcome measures in the above areas was influenced heavily by systems theory which directed that family focused outcome measures, including measures of parent child interaction, be utilized.

Committee members felt that it would be a good exercise to look at all 16 studies from a systems theory conceptual framework, and suggest which research questions and outcome measures were theory driven.

Dissemination

Allen Crocker, Diana Slaughter, Karl White, and Chuck Lowitzer participated in this small group discussion. The original dissemination plan of the project was reviewed, and efforts to date were summarized. The potential problems with publishing preliminary data were discussed at length, and it was suggested that we be very careful about publishing data until sample sizes are relatively large and data are complete for at least each annual testing period. For certain projects, it may be wise to wait until 2 or 3 years worth of data are collected to make sure that initial findings remain stable over time. It was also suggested that EIRI staff consider publishing one or more methodological and/or policy articles which would provide the foundation and context for the findings when they became available. One such article is currently in press and should be available soon. Finally, Advisory Committee members recommended that we seek the most prestigious outlets for publishing the results of our work. Given the importance of these projects, this will help to ensure that the results receive the attention they deserve.

On-Site Evaluations

Bud Fredericks, Steve Warren, Ellen Frede, and Teri Wingate-Corey participated in this small group discussion. Since the last meeting of the Advisory Committee, each of the research sites was visited using on-site evaluation procedures developed by EIRI staff. The on-site evaluation was designed to complement other treatment verification measures to ensure that treatment at the sites is being implemented as intended, to assure whether site practices reflect what is known in the field to be effective, and to document the intervention for research purposes. Drs. Warren and Fredericks provided feedback and suggestions regarding the on-site evaluation materials. The basic concern they raised was whether the instruments were sensitive enough and clearly documented best practices. They asked the extent to which the procedures were capable of documenting changes in intervention practices over time. While the instrument should be sensitive enough to reflect this change, there is some danger in it, because the field might question whether the program was good to begin with if it is found to be getting better.

Some specific items of concern were the lack of detailed criteria for determining how well the data collection procedures were implemented, the subjectivity of many of the teacher-child interaction criteria, and the need for more intensive information about the actual instruction time received by parents from project staff and by children from staff and parents. It was recommended that the observation should be conducted by sampling activities over a period of a few days to determine the instructional time per child.

Site Management (Large Group)

A letter from a former employee at the LSU site, which raised some concerns about the integrity of the Visually Impaired (VI) site, was distributed and discussed. In an effort to keep the discussion germane to the group of longitudinal studies instead of just the one site, the committee focused their remarks on the: (a) procedures for site administration, (b) the relationship between the site personnel and the project personnel, and (c) quality assurance procedures.

Procedures for Site Administration

The issue of criteria for subject inclusion was raised, and the committee were assured that each site has clear, written criteria, but that on occasion site staff may make mistakes. There are checks for these, and children who are found not to meet the criteria are deleted from the analysis. In addition, some committee members felt that procedures for quality control, documentation of operational procedures, and principles used to respond to similar criticism in other instances should be developed. If problems arise, such criteria and procedures would provide a basis for gathering appropriate information and responding.

Relationship of Site Staff with Project Staff

Because the quality of the relationship between the project and the staff will, to a large measure, determine the success of the research, committee members suggested that a yearly meeting of all site liaisons might be worthwhile. If that is not possible, some form of yearly contact with senior project staff should be done. Given the high turnover of project staff involved in site coordination, there is a danger that information will be lost or project objectives compromised unless there is a mechanism for good communication between EIRI staff and site liaisons.

Quality Assurance Procedures

The discussion of the LSU-VI site brought up the issue of whether both treatments were of high quality. One committee member suggested that a brief summary of site status in the form of a matrix with quality indicators delineated by site would be useful (e.g., enrollment, data transmission, financial support, program status, etc.). In addition, experts in the populations served by each site could be involved in giving a "stamp of approval" to the procedures and practices of each site.

Assessment of Parental Involvement (Large Group)

EIRI staff proposed the following three questions regarding parental involvement which guided this discussion:

1. Have we conceptualized the domain of parental involvement appropriately?
2. Are we adequately measuring the degree to which parents are involved in the intervention?
3. Should we be measuring the role parents play as advocates and the effect the program has on this role?

Discussion ranged from specific advice on data collection to the more general issue of what should be measured across sites and how it should be measured. The specific advice was that parent interviews should be conducted by someone culturally acceptable and familiar to the parents, that each family should have a case manager different from the direct intervenor, and that contact hours with parents should be logged.

The question of whether to assess parents' roles as advocates opened a discussion of the larger issue of program objectives and classifying outcomes as main effects or side effects. Parents' roles as advocates could be measured, but it should be kept within the context of whether it is an objective of the program. It was pointed out that many of the complementary measures may well be side effects, and that it would be useful to gather information from sites on what they view as their primary objectives.

Small Group Discussions

Videotape Assessment

This session focused on the use of videotapes of parent child interaction, motor performance, and severe handicaps. Three advisory council members (Steve Warren, Dick Darlington, and Allen Crocker) were in attendance. Glen Casto and Teri Wingate-Corey presented a severely handicapped videotape; then discussed procedures and scoring systems for the parent/child interaction, severely handicapped, and motor tapes. The following suggestions were made by the Advisory Committee members:

1. Have more general categories of evaluation to obtain quality ratings of parent-child interaction and increase reliability ratings.
2. Overlay the specific motor and parent-child interaction ratings with a general rating system and have a lay person do the ratings to obtain social validation of the system.
3. Get an interaction rating of the parent working with the child during the motor videotape.
4. Make sure in the motor and interaction videotapes that the child is comfortable working with the intervenor. The tape should reflect competence not performance. The state of the child will effect the quality of the videotape ratings. Make sure we get an assessment of the child's true competencies and not a reflection of a situation. Don't videotape on a day when the child is upset, tired, etc.
5. Related to #4, if possible, do time sampling to determine competency vs. performance.
6. Also related to #4, complete a form that evaluates the state of the child before videotaping.
7. Rate the mother on the effectiveness of implementing the program in the severely handicapped motor tape.
8. Be sure to evaluate the response of the infant when the mother returns to the room in the parent-child interaction videotape.

9. Obtain videotapes on a deviant population to see if our rating system accurately discriminates the two populations.

Data Analysis

Dick Darlington and Craig Ramey met with Karl White, Chuck Lowitzer, and Steve Barnett to discuss questions concerning data analysis procedures. Discussion focused on the specific application of analysis of covariance procedures. We discussed whether the approach being used to select appropriate covariance was sensible. Following this, we discussed the use of analysis of covariance with dichotomous variables (e.g., sex) or with variables where the distributions were not normally distributed (e.g., average hours per day of day care or identify of primary care giver). The general conclusions of the discussion were that the approach currently being used was good, and that in those cases where dichotomous variables or variables which were not normally distributed were correlated with outcomes, we should continue to use them as covariates. We also discussed methods for developing point estimates for categorical data and whether such estimates could be used in analysis of covariates.

Health Forms/Birth Certificates

Allen Crocker and Ellen Frede met to discuss the health forms being used in the annual assessment and the use of birth certificate data as a part of the study. Aside from a few small wording suggestions for the health form, the discussion basically focused on the need for a clear classification system for the disabilities of the children. For example, many children labeled as sensory impaired actually suffer from one of various syndromes and are often multiply impaired. A simple classification of visual or hearing impairment could be quite misleading and result in analysis that does not adequately consider the child's deficits. In addition, there are rare conditions such as Hurler's, which, if not identified appropriately, can also confound results since they are degenerative conditions. It was recommended that medical records on all of the subjects be collected and that a medical expert code all of the children's conditions according to the World Health Organization's ICD-9-CM system.

Recommendations Made by EIRI Advisory Board

Following the discussions summarized above, the Advisory Committee met in an executive session to formulate the major recommendations they had for the project. Those recommendations are summarized below.

1. As recommended previously (Advisory Board meeting in January 1987), continued work on a conceptual framework appears in order. A brief statement should be developed that describes what guided the selecting of sites, research designs, methodologies, and data collection in terms of both process and outcomes.

   Careful specification of each study site's program goals, mechanism for inducing change, and outcome focus should be undertaken.

   Develop an article for publication in a respected and widely disseminated journal on the project's conceptual framework, underlying rationale for selection of sites, designs, measures, and outcome foci.

2. Disseminate outcome results when the following criteria are met:

   * data collection complete for all subjects at a particular site
   * program fidelity has been established
   * data collection completed on all measures for a particular site

   To lend support and credibility to results, submit project articles to journals that maintain a high-quality peer review process.

3. In opposition to a previous recommendation (Advisory Board meeting, January 1987), validate the quality of service being provided by using outside experts (e.g., person not on EIRI or site staff) that have recognized credentials in early childhood/special education, research methodology, and/or specific content areas such as visually or hearing impaired.

4. Develop more precise a priori criteria for on-site evaluation of treatment verification.

5. Future meetings should include:

   * brief review of project status which particularly addresses problems being encountered (e.g., staff, recruitment, data collection, attrition, funding, etc.).
   * agendas that state issues to be addressed under each topic.

   Prior to meetings, more direction provided to Board members on which issues are to be addressed.

6. Prior to next meeting, share with Board members a written report on cost-effectiveness and cost-analysis procedures that are being developed and used. At the meeting, provide opportunity for Board members to ask questions raised by the paper.

   Consider using a cost-analysis expert to review the work in this area.

7. To enhance continuity, exchange of information, and provide support to site staff, project directors should consider visiting each site once per year.

8. Develop procedures to verify nature of treatment populations (e.g., biomedical information). Clarify general labels being used to designate treatment groups (e.g., multiply handicapped).

Committee Members' Rankings of Topics

	1st	2nd	3rd	4th	5th	6th	7th	Unranked
1. Longitudinal Tracking		Haltom	Slaughter	Ramey				Bricker
2. Conceptual Framework	Ramey	Darlington				Warren		Bricker
3. Child Health								Crocker
4. Demographics							Warren	Crocker
5. Complementary								Bricker
6. Video Assessment	Warren						Slaughter	Bricker
7. Treatment Verification		Ramey	Warren					
8. Data Analysis	Darlington		Haltom			Fredericks	Ramey	
9. Naturalistic								
10. Fundraising						Ramey		
11. Dissemination	Slaughter				Warren			Crocker
12. EIPI					Haltom			Bricker
13. Core Measures				Fredericks	Ramey	Slaughter		Bricker
14. Data Management			Darlington	Haltom	Fredericks			
15. Onsite Evaluations	Haltom			Warren			Fredericks	Crocker
16. Economic Analyses								
17. Parental Involvement			Ramey Fredericks	Slaughter		Haltom		Crocker Bricker
18. Parent Coping		Fredericks			Slaughter			Crocker Bricker
19. Staff Attitudes								Crocker
20. Site Discussions	Fredericks	Slaughter Warren					Haltom	